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Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-30413 Tennessee Univ., Knoxville.
INVESTIGATION OF TRANSONIC AERODYNAMIC PHENOMENA FOR WING MOUNTED EXTERNAL STORES Ph.D. Thesis
Victor Elliott Studwell 1974 115 p
Avail: Univ. Microfilms Order No. 74-17738

The effect of external wing mounted pylons with engines or stores on the flying qualities of aircraft at transonic speeds was studied. In order to establish a fundamental understanding of this problem, an experimental study has been conducted with a two-dimensional, straight leading edge, airfoil model with simple pylon/store configurations externally mounted on the lower surface. Airfoil surface pressure distributions, oil flow studies, and wake total pressure surveys were obtained in the experiment. Integration of the surface pressure distributions produced the aerodynamic force and moment data. Analysis of these data revealed that the pylon/store configuration had little effect on the lift and drag characteristics of the airfoil. However, the presence of the pylon/store configuration changed the airfoil pitching tendency from nose-up to nose-down. Dissert. Abstr.

N74-30414*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SINGLE WING SUPERSONIC AIRCRAFT Patent Application
Robert T. Jones, inventor (to NASA) Filed 12 Aug. 1974 40 p
(NASA-Case-ARC-10470-3; US-Patent-Appl-SN-496779) Avail: NTIS HC $5.00 CSCL 01C

An aircraft is described, having a single fuselage with a main wing and a horizontal stabilizer airfoil pivotally attached at their centers to the fuselage. The pivotal attachments allow the airfoils to be yawed relative to the fuselage for high speed flight, and to be positioned at right angles with respect to the fuselage during takeoff, landing, and low speed flight. The main wing and the horizontal stabilizer are upwardly curved from their center pivotal connections towards their ends to form curvilinear dihedrals. NASA

N74-30415*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 43, APRIL 1974
Apr. 1974 120 p refs
(NASA-SP-7037(43)) Avail: NTIS HC $4.50 CSCL 01A

This special bibliography lists 421 reports, articles, and other documents introduced into the NASA scientific and technical information system in March 1974. Author

N74-30416*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A SHORT ANNULAR DUMP DIFFUSER USING WALL TRAILING-EDGE SUCTION
Albert J. Juhasz Washington Aug. 1974 21 p refs
(NASA-TM-X-3093; E-7944) Avail: NTIS HC $3.00 CSCL 01A

A short annular dump (abrupt flow area change) diffuser was tested with suction through wall trailing-edge slots at inlet Mach numbers of 0.19 and 0.27 and at near ambient inlet temperature and pressure, with suction flow varied from zero to 10 percent of the inlet air mass-flow rate. The overall ratio of diffuser exit area to inlet area was 4.0, and the ratio of length to inlet height was 2.0. By applying suction flow separately on either wall or to both walls simultaneously, the original annular jet profile could be altered to either a hub- or tip-biased profile. Diffuser effectiveness was increased from about 25 percent with no suction to 50 percent at 6 percent outer-wall suction and to 52 percent at a combined suction rate on both walls of 10.25 percent. At the same time, diffuser total pressure loss was reduced by one-fourth. Author

N74-30417*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LONGITUDINAL AERODYNAMIC PERFORMANCE OF A SERIES OF POWER-LAW AND MINIMUM WAVE DRAG BODIES AT MACH 6 AND SEVERAL REYNOLDS NUMBERS
George C. Ashby, Jr. Washington Aug. 1974 27 p refs
(NASA-TM-X-2713; L-7609) Avail: NTIS HC $3.25 CSCL 01A

Experimental data have been obtained for two series of bodies at Mach 6 and Reynolds numbers, based on model length, from 1.4 million to 9.5 million. One series consisted of axisymmetric power-law bodies geometrically constrained for constant length and base diameter with values of the exponent n of 0.25, 0.5, 0.6, 0.667, 0.75, and 1.0. The other series consisted of positively and negatively cambered bodies of polygonal cross section, each having a constant longitudinal area distribution conforming to that required for minimizing zero-lift wave drag at hypersonic speeds under the geometric constraints of given length and volume. At the highest Reynolds number, the power-law body for minimum drag is blunter (exponent n lower) than predicted by inviscid theory (n approximately 0.6 instead of n = 0.667); however, the peak value of lift-drag ratio occurs at n = 0.667. Viscous effects were present on the bodies of polygonal cross section but were less pronounced than those on the power-law bodies. The trapezoidal bodies with maximum width at the bottom were found to have the highest maximum lift-drag ratio and the lowest mimimum drag. Author

N74-30418*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
ASSESSMENT OF A WAKE VORTEX FLIGHT TEST PROGRAM
Selden B. Spangler, Marnix F. E. Dillenius, Richard G. Schwind, and Jack N. Nielsen Jul. 1974 92 p refs
(Contract NAS2-6973)

(NASA-CR-114736; NEAR-TR-48) Avail: NTIS HC $7.75 CSCL 01A

A proposed flight test program to measure the characteristics of wake vortices behind a T-33 aircraft was investigated. A number of facets of the flight tests were examined to define the parameters to be measured, the anticipated vortex characteristics, the mutual interference between the probe aircraft and the wake, the response of certain instruments to be used in obtaining measurements, the effect of condensation on the wake vortices, and methods of data reduction. Recommendations made as a result of the investigation are presented. Author

N74-30419# Sandia Corp., Albuquerque, N.Mex.
BIBLIOGRAPHY OF AERODYNAMICS COMPUTER PROGRAMS
W. H. Curry, comp. Mar. 1973 142 p refs Supersedes SC-TM-68-837
(SLA-73-189; SC-TM-68-837) Avail: NTIS HC $9.75

A compilation of computer programs used in aerodynamics-related work at Sandia Laboratories is presented. Subject areas include aerodynamic coefficients and load prediction, data reduction, flow-field calculations, heat transfer and ablation, and trajectory and vehicle motions. Each program entry lists the originator, reference document, descriptive material, and personal contacts at Sandia Laboratories. This compilation of programs supersedes that prepared by P. J. Roache and published as SC-TM-68-837, November 1968. Author (NSA)

N74-30420# Dayton Univ. Research Inst., Ohio.
THE EFFECT OF BOUNDARY LAYER GROWTH ON THE STABILITY OF SUPERSONIC BOUNDARY LAYERS Final Report, Aug. 1971 - Dec. 1972
Louis I. Boehman Sep. 1973 26 p refs
(Contract F33615-70-C-1019; AF Proj. 1366)
(AD-780477; AFFDL-TR-73-96) Avail: NTIS CSCL 01/1

The results of an investigation to determine the effects of boundary layer growth on the stability of supersonic laminar boundary layers are reported. Mean flow terms which arise because of boundary layer growth were added to the parallel flow, linearized small disturbance equations applicable to supersonic laminar boundary layer flows. Traveling wave solutions for the small disturbance quantities were assumed and the resulting stability equations were numerically integrated using Gram-Schmidt orthonomalization to control parasitic error growth. Various cases of augmented stability equations were considered ranging from the inclusion in all equations of all terms which arise because of boundary layer growth to the inclusion of only the streamtube stretching term to the streamwise momentum equation. (Modified author abstract) GRA

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-30421* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEPLOYABLE FLEXIBLE VENTRAL FINS FOR USE AS AN EMERGENCY SPIN RECOVERY DEVICE IN AIRCRAFT Patent
Sanger M. Burk, Jr., inventor (to NASA) Issued 30 Jul. 1974 13 p Filed 14 Sep. 1972 Supersedes N73-10031 (11 - 01, p 0004)
(NASA-Case-LAR-10753-1; US-Patent-3,826,448; US-Patent-Appl-SN-289018; US-Patent-Class-244-91; US-Patent-Class-244-327; US-Patent-Class-244-90R) Avail: US Patent Office CSCL 01B

A flexible fin device for mounting on an aircraft to effect spin recovery is described. The device may be selectively deployed to provide a triangular planform of flexible material to provide spin recovery, and retracted for compact storage during non-use. A single flexible fin may be deflected in a specific direction depending on direction of spin rotation, or two flexible fins forming an inverted V configuration may be used. The device is mounted on the underbody of the aircraft.
Official Gazette of the U.S. Patent Office

N74-30422*# Bell Aerospace Co., Buffalo, N.Y.
DATA AND RESULTS FROM A STUDY OF INTERNAL CONVECTIVE COOLING SYSTEMS FOR HYPERSONIC AIRCRAFT
F. M. Anthony, W. H. Dukes, and R. G. Helenbrook Jun. 1974 365 p refs
(Contract NAS1-11357)
(NASA-CR-132432) Avail: NTIS HC $8.00 CSCL 01C

An extensive survey of current and future airframe construction materials and coolants was conducted, so that the most promising candidates could be examined for cooled-panel, cooling-system and airframe concepts. Consideration was given to over 100 structural materials, 50 coolants, 6 classes of structural panel concepts, 4 classes of thermal panel concepts with numerous variations, and 3 overall cooled airframe design approaches, including unshielded, shielded, and dual temperature types. The concept identification and parametric comparison phase examined all major elements of the convectively cooled airframe, including the differing requirements at various locations on the aircraft. The parametric results were used for the investigation to two separate vehicles, a hypersonic transport with a length of 96 meters (314 feet) and a weight of 24,000 kg (528,600 lb) and a hypersonic research airplane, with a length of 25m (80 ft) and a weight of 20,300 kg (447,000 lb). Author

N74-30423*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLYOVER NOISE CHARACTERISTICS OF A TILT-WING V/STOL AIRCRAFT (XC-142A)
Robert J. Pegg, Herbert R. Henderson, and David A. Hilton Washington Aug. 1974 24 p refs
(NASA-TM-X-3074; L-9037) Avail: NTIS HC $3.00 CSCL 20A

A field noise measurement investigation was conducted during the flight testing of an XC-142A tilt-wing V/STOL aircraft to define its external noise characteristics. Measured time histories of overall sound pressure level show that noise levels are higher at lower airspeeds and decrease with increased speed up to approximately 160 knots. The primary noise sources were the four high-speed, main propellers. Flyover-noise time histories calculated by existing techniques for propeller noise prediction are in reasonable agreement with the experimental data. Author

N74-30424*# Scientific Translation Service, Santa Barbara, Calif.
A SIMPLE CRITERION FOR REDUCTION OF MULTIPLE GUST LOADS WITH ACCELERATION CONTROL
P. Hamel and U. Graeber Washington NASA Jul. 1974 28 p refs Transl. into ENGLISH from the German report DLR-Mitt-70-12 Presented at the Meeting of the DGLR Sci. Comm. on Flight Performance and Flight Characteristics, Darmstadt, 12-13 Nov. 1970
(Contract NASw-2483)
(NASA-TT-F-15800; DLR-Mitt-70-12) Avail: NTIS HC $4.50 CSCL 01C

The possibility of an acceleration control for the reduction of multiple loads produced by air turbulence is investigated. It is found that the method of tune lift control results in the most optimal gust load reduction. A schematic diagram of the acceleration control to reduce the sensitivity of the aircraft to air turbulence is provided. It is stated that the tuning criterion for optimum suppression of gust sensitivity found for acceleration control is also valid for other controller circuits. This is evidenced from the perturbation part of the system of equations which consists of gust and controller perturbation terms. Author

N74-30425*# Scientific Translation Service, Santa Barbara, Calif.
COMPARISON OF THE INFLUENCE OF HORIZONTAL AND VERTICAL GUST INTERFERENCES ON AIRCRAFT LONGITUDINAL MOTION
G. Schaenzer Washington NASA Jul. 1974 7 p Transl. into ENGLISH from the German report DLR-Mitt-70-12 Presented

at the meeting of the DGLR Sci. Comm. on Flight Performance and Flight Characteristics, Darmstadt, 12-13 Nov. 1970
(Contract NASw-2483)
(NASA-TT-F-15801; DLR-Mitt-70-12) Avail: NTIS HC $4.00 CSCL 01B

In determining the influence of gust loads on a noncontrolled longitudinal aircraft motion, it is shown to be necessary to take into account horizontal and vertical gust components, their frequencies and power spectra. The gust disturbances can be divided into two typical frequency regions, independent of the reaction of the aircraft, which lie approximately above and below the eigen frequency of the fast angle of attack oscillation. At the higher gust frequencies, the vertical gusts dominate, especially at altitudes above 500 meters. At altitudes below 50 meters, the horizontal gusts have the greatest influence in both frequency regions. Author

N74-30426*# Scientific Translation Service, Santa Barbara, Calif.
SIMULATION OF ATMOSPHERIC TURBULENCE, IN PARTICULAR ITS INFLUENCE ON AIRCRAFT
W. Schattenmann Washington NASA Jul. 1974 23 p refs Transl. into ENGLISH from the Report DLR-Mitt-70-12 (Colonge), 1970, p 143-158 Presented at the Meeting of the DGLR Sci. Comm. on Flight Performance and Flight Characteristics, Darmstadt, West Ger., 12-13 Nov. 1970
(Contract NASw-2483)
(NASA-TT-F-15802; DLR-Mitt-70-12) Avail: NTIS HC $4.25 CSCL 01C

The atmospheric turbulence model used in American flight worthiness literature is discussed. In a model, the turbulence is characterized by the following properties: stationary conditions, homogeneity and isotropy. This makes it possible to use one-dimensional correlation functions and spectra for the gust velocities. It is found that for aircraft yaw motion, the lateral gust velocity and the component of vertical gust velocity which is asymmetric with respect to the aircraft symmetry plane are the components which determine the perturbations. The corresponding component of the horizontal gust usually plays a subordinate role. The model must be extended to extremely slow flight and to flight conditions near the ground. Author

N74-30427*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SIMULATOR INVESTIGATION OF ENGINE FAILURE COMPENSATION FOR POWERED-LIFT STOL AIRCRAFT
Albert W. Nieuwenhuijse and James A. Franklin May 1974 69 p refs
(NASA-TM-X-62363) Avail: NTIS HC $3.75 CSCL 01C

A piloted simulator investigation of various engine failure compensation concepts for powered-lift STOL aircraft was carried out at the Ames Research Center. The purpose of this investigation was to determine the influence of engine failure compensation on recovery from an engine failure during the landing approach and on the precision of the STOL landing. The various concepts include: (1) cockpit warning lights to cue the pilot of an engine failure, (2) programmed thrust and roll trim compensation, (3) thrust command and (4) flight-path stabilization. The aircraft simulated was a 150 passenger four-engine, externally blown flap civil STOL transport having a 90 psf wing loading and a .56 thrust to weight ratio. Results of the simulation indicate that the combination of thrust command and flight-path stabilization offered the best engine-out landing performance in turbulence and did so over the entire range of altitudes for which engine failures occurred. Author

N74-30428*# Douglas Aircraft Co., Inc., Long Beach, Calif.
PARAMETRIC STUDY OF STOL SHORT-HAUL TRANSPORT ENGINE CYCLES AND OPERATIONAL TECHNIQUES TO MINIMIZE COMMUNITY NOISE IMPACT Final Report
Jun. 1974 418 p refs
(Contract NAS2-6994)
(NASA-CR-114759; MDC-J4437) Avail: NTIS HC $24.00 CSCL 01C

The effect of aircraft operational techniques in the terminal area on community noise impact of future short haul aircraft was investigated. Aircraft equipped with Mechanical Flap (MF) and Aircraft with Externally Blown Flap (EBF) were used to study the noise impact at four U.S. airports. The four airports were: (1) Hanscom Field (Boston), (2) Washington National (D.C.), (3) Midway (Chicago) and (4) Orange County (California). With the exception of Washington National (D.C.), the study showed that a reduction of approximately 40 percent in the number of people highly annoyed can be obtained by using the recommended operational techniques. The evaluation procedures and methodology developed in the study represent an advance in acoustical state-of-the-art and provide an effective and useful tool for determining aircraft noise impact on the airport community. Author

N74-30429*# Rockwell International Corp., Columbus, Ohio. Aircraft Div.
DIGITAL FLIGHT CONTROL ACTUATION SYSTEM STUDY Final Report
R. Rossing and R. Hupp Apr. 1974 490 p
(Contract NAS1-12718)
(NASA-CR-132447; NR74H-47A) Avail: NTIS HC $9.75 CSCL 01C

Flight control actuators and feedback sensors suitable for use in a redundant digital flight control system were examined. The most appropriate design approach for an advanced digital flight control actuation system for development and use in a fly-by-wire system was selected. The concept which was selected consisted of a PM torque motor direct drive. The selected system is compatible with concurrent and independent development efforts on the computer system and the control law mechanizations. Author

N74-30430# Advisory Group for Aerospace Research and Development, Paris (France).
THE TREATMENT OF INTERACTION OF HANDLING QUALITIES, STABILITY, AND CONTROL ON STRUCTURAL LOADS BY CURRENT SPECIFICATIONS Summary Report
Clifford F. Newberry (Boeing Co., Wichita, Kans.) Jun. 1974 15 p refs
(AGARD-R-621) Avail: NTIS HC $4.00

Aircraft structural loads arise not only from such sources as maneuvers, landings, gusts and taxiing, but are developed and influenced by aircraft handling qualities, stability and control characteristics. The structure, the aerodynamics, and the control system are jointly considered to evaluate the capability to solve the interaction problem. Usage and adequacy of existing specifications are considered. Factors which influence the decision to use advanced control techniques and analytical studies and tests to insure technical integrity are explored. Author

N74-30431*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTER PROGRAMS FOR ESTIMATING AIRCRAFT TAKEOFF PERFORMANCE IN THREE DIMENSIONAL SPACE
Jeff V. Bowles Jul. 1974 57 p refs
(NASA-TM-X-62366) Avail: NTIS HC $6.00 CSCL 01C

A set of computer programs has been developed to estimate the takeoff and initial climb-out maneuver of a given aircraft in three-dimensional space. The program is applicable to conventional, vectored lift and power-lift concept aircraft. The aircraft is treated as a point mass flying over a flat earth with no side slip, and the rotational dynamics have been neglected. The required input is described and a sample case presented. Author

N74-30432*# Lockheed-Georgia Co., Marietta.
SMALL SCALE MODEL STATIC ACOUSTIC INVESTIGATION OF HYBRID HIGH LIFT SYSTEMS COMBINING UPPER SURFACE BLOWING WITH THE INTERNALLY BLOWN FLAP
T. W. Cole and E. A. Rathburn Jul. 1974 280 p refs
(Contract NAS2-7812)
(NASA-CR-114757; LG74ER0096) Avail: NTIS HC $17.00 CSCL 01A

A static acoustic and propulsion test of a small radius Jacobs-Hurkamp and a large radius Flex Flap combined with four upper surface blowing (USB) nozzles was performed. Nozzle force and flow data, flap trailing edge total pressure survey data, and acoustic data were obtained. Jacobs-Hurkamp flap surface pressure data, flow visualization photographs, and spoiler acoustic data from the limited mid-year tests are reported. A

pressure ratio range of 1.2 to 1.5 was investigated for the USB nozzles and for the auxiliary blowing slots. The acoustic data were scaled to a four-engine STOL airplane of roughly 110,000 kilograms or 50,000 pounds gross weight, corresponding to a model scale of approximately 0.2 for the nozzles without deflector. The model nozzle scale is actually reduced to about .17 with deflector although all results in this report assume 0.2 scale factor. Trailing edge pressure surveys indicated that poor flow attachment was obtained even at large flow impingement angles unless a nozzle deflector plate was used. Good attachment was obtained with the aspect ratio four nozzle with deflector, confirming the small scale wind tunnel tests. Author

N74-30433*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
PARACHUTE DYNAMICS AND STABILITY ANALYSIS Final Report, 1 Feb. 1973 - 1 Feb. 1974
S. K. Ibrahim and R. A. Engdahl Feb. 1974 181 p refs
(Contract NAS8-28607)
(NASA-CR-120326) Avail: NTIS HC $12.25 CSCL 01B

The nonlinear differential equations of motion for a general parachute-riser-payload system are developed. The resulting math model is then applied for analyzing the descent dynamics and stability characteristics of both the drogue stabilization phase and the main descent phase of the space shuttle Solid Rocket Booster (SRB) recovery system. The formulation of the problem is characterized by a minimum number of simplifying assumptions and full application of state-of-the-art parachute technology. The parachute suspension lines and the parachute risers can be modeled as elastic elements, and the whole system may be subjected to specified wind and gust profiles in order to assess their effects on the stability of the recovery system. Author

N74-30434*# Translation Consultants, Ltd., Arlington, Va.
THE AIRCRAFT AND NATURAL CLIMATE CONDITIONS
K. M. Shpilev and A. B. Kruglov Washington NASA Jul. 1974 151 p refs Transl. into ENGLISH of the book "Samoleti Prirodno-klimaticheskiye Usloviya" - Moscow, Military Press of the USSR Ministry of Defense, 1972 172 p
(Contract NASw-2038)
(NASA-TT-F-793) Avail: NTIS HC $5.00 CSCL 01C

The influence of natural climatic conditions on the technical state and operation of modern aircraft is examined. The primary climatic and soil factors which damage aircraft material and their distribution in terms of the earth's geographic zones are analyzed. The operational features of aircraft and related equipment under varying climatic conditions and the operational features of the airfields, ground support equipment, and maintenance personnel are examined. Recommendations are made concerning the design of aircraft materials and conducting tests which simulate the damaging influence of climatic factors. Author

N74-30435# Sandia Corp., Livermore, Calif.
OPTIMIZATION OF A LIFTING PARACHUTE SYSTEM FOR LAYDOWN DELIVERY OF A BOMB
R. E. Rychnovsky and R. N. Everett Jan. 1974 36 p refs
(Contract AT(29-1)-789)
(SLL-73-295) Avail: NTIS HC $4.00

An analytic investigation has been performed to study the merits of incorporating a lifting parachute into a 2400 lb bomb delivery system. Lift to drag ratios of 0.3 for the initial ribbon parachute are sufficient to lift the bomb and allow enough time for a second parachute to slow the system to its terminal velocity. Impact velocities of less than 60 ft/s and impact angles greater than 50 deg appear achievable for a release velocity range from Mach 0.53 to 1.2. Substantial improvements over alternate parachute systems appear feasible. Author (NSA)

N74-30436# Institut Franco-Allemand de Recherches, St. Louis (France).
DAMAGE THRESHOLD FOR LIGHT WALLS UNDER SINGLE OR REPEATED SONIC BOOMS, PART 2 [DETERMINATION DU SEUIL D'ENDOMMAGEMENT DE CLOISONS LEGERES EXPOSEES A DES BANGS UNITAIRES OU REPETES, 2 EME PARTIE]
C. H. Johe, J. P. Thybaut, and R. Hunkler 4 Apr. 1973 51 p refs In FRENCH
(Contract DRME-72/184)
(ISL-11/73) Avail: NTIS HC $5.75

A series of fatigue tests were performed on seven light walls subjected to sonic boom. The geometrical characteristics were identical to those described in report ISL 35/72 but with increased stiffness. The cracking thresholds were higher and their values between 10 and 28 mbar are discussed. The influence of a loaded shelf on thresholds was shown to be negligible. Fatigue tests showed that the threshold for first crack appearance was not modified by repetitive sonic booms but that repetition of higher intensity bangs in the 15 to 18 mbar range led to destruction within 20 to 40 bangs. ESRO

N74-30437# McDonnell Aircraft Co., St. Louis, Mo.
DESIGN METHODS FOR SPECIFYING HANDLING QUALITIES FOR CONTROL CONFIGURED VEHICLES. VOLUME 1: TECHNICAL DISCUSSION Technical Report, 15 Jan. - 15 Nov. 1973
Robert V. Brulle and Daniel C. Anderson 15 Nov. 1973 146 p refs
(Contract F33615-73-C-3064)
(AD-780099; AFFDL-RD-73-142-Vol-1) Avail: NTIS CSCL 01/3

A method for predicting aircraft pilot ratings which is applicable to Control Configured Vehicles (CCV's) is developed based on aircraft performance and pilot workload. A discussion of this method of handling quality analysis, and a description of four random tracking pilot rating correlations developed using the method are presented in Volume I of the report. A literature survey classifying the most recent reports applicable to flying qualities is tabulated. (Modified author abstract) GRA

N74-30438# Naval Ordnance Lab., White Oak, Md.
SELF-COMPENSATING STORE EJECTION Final Report, 1970 - 1973
Raymond R. Maestri and Leon H. Schindel 5 Feb. 1974 63 p refs
(ZF61312001)
(AD-780214; NOLTR-74-32) Avail: NTIS CSCL 01/3

The report concerns the concept of a continuously adjustable ejector system which accounts for the aircraft flight condition and ejects a store with an initial angular rate and linear velocity that results in a safe, repeatable, predictable nearly ballistic trajectory throughout the aircraft/store carriage envelope. The concept is especially important in the supersonic regime where the aerodynamic forces in the disturbed flow field control the initial trajectory. (Modified author abstract) GRA

N74-30439# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
DEVELOPMENT OF AN EMPIRICALLY BASED COMPUTER PROGRAM TO PREDICT THE AERODYNAMIC CHARACTERISTICS OF AIRCRAFT. VOLUME 1: EMPIRICAL METHODS Final Report, Dec. 1972 - Oct. 1973
Roy T. Schemensky Nov. 1973 219 p refs
(Contract F33615-73-C-3043; AF Proj. 1476)
(AD-780100; AFFDL-TR-73-144-Vol-1) Avail: NTIS CSCL 01/3

The report presents the methods, equations, and substantiating data for an empirically based computer program for the rapid and accurate evaluation of the aerodynamic characteristics of large aircraft (bombers, tankers, and transports) from takeoff through landing and through the subsonic, transonic, and supersonic speed regimes. The program calculates lift, moment, and drag characteristics at both low- and high-lift conditions, including the effects of ground proximity during landing and takeoff. The input requires the configuration geometry and the aerodynamic conditions for which solutions are desired. The program includes the capability of analyzing both fixed-wing and variable-sweep-wing configurations as well as the aerodynamic characteristics of the most recent supercritical wing designs. (Modified author abstract) GRA

N74-30440# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EXPERIMENTAL INVESTIGATION OF BRAKE CHARACTERISTICS CONDUCTIVE TO STRUT CHATTER M.S. Thesis
Jerry D. Brewer Mar. 1974 123 p refs
(AD-780505; GAW/MC/74-2) Avail: NTIS CSCL 01/2

Fourteen dynamometer tests were performed on a B.F. Goodrich 2-727 brake assembly to investigate the characteristics inherent in modern brake design which are considered as indicators for brake induced landing gear strut chatter. The tests were designed to simulate normal service conditions experienced by the brake as part of the USAF T-38A aircraft system. Data from nine simulated landing roll tests and five simulated taxi tests were used to determine the slopes of the instantaneous coefficient of kinetic friction versus relative rubbing velocity curves for 10 ft/sec squared, 8 ft/sec squared, and 6 ft/sec squared deceleration conditions. (Modified author abstract) GRA

N74-30441# Army Natick Labs., Mass. Clothing and Personal Life Support Equipment Lab.
ENGINEERING EVALUATION OF AGE LIFE EXTENSION, T-10 TROOP MAIN PARACHUTE
Richard D. Wells, Vasant K. Devarakonda, and Michael E. Mahar Mar. 1974 40 p refs
(AD-779956; C/PLSEL-123; USA-NLABS-TR-74-46-CE) Avail: NTIS CSCL 01/3

An engineering evaluation of T-10 Troop Main Parachute Equipment sampled from the six to twelve year total-age classes in service at Fort Bragg, N.C. was conducted by the US Army Natick Laboratories. Dynamic drop tests were made on harnesses, and laboratory strength and elongation tests were made on nylon material components. The findings support the present 13 year total age limit for harnesses and risers, and lead to the conclusion that the 12 year limit recently established for T-10 Chest Reserve Parachute Assemblies applies equally to the Main Parachutes. Log book data were insufficient to provide a basis for establishing limits for initial storage life and service life, as distinguished from total life. Author (GRA)

N74-30442# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS), CH-47A ELECTRO-MECHANICAL CYCLIC TRIM ACTUATOR Interim Report, Jan. 1964 - Jul. 1973
May 1974 22 p
(AD-779957; USAAVSCOM-TR-74-27) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distribution can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N74-30443# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
RELIABILITY ANALYSIS OF FATIGUE-SENSITIVE AIRCRAFT STRUCTURES UNDER RANDOM LOADING AND PERIODIC INSPECTION Technical Report, Oct. 1973 - Jan. 1974
Jann-Nan Yang and Walter J. Trapp Feb. 1974 62 p refs (AF Proj. 7351)
(AD-779830; AFML-TR-74-29) Avail: NTIS CSCL 11/6

A reliability analysis of fatigue-sensitive structures, based on the application of random vibration theory, is presented. The fatigue process involved here consists of crack initiation, crack propagation and strength degradation. After a fatigue crack is initiated, fracture mechanics is applied to predict crack propagation under random loading. The aircraft structure is subjected to periodic inspection in service. When a fatigue crack is detected during inspection, the implicated component is either repaired or replaced. Such a renewal process is taken into account in the present analysis. Taking into account all the random variables as well as the random loadings, the solution for the probability of first failure in a fleet of aircraft is derived. (Modified author abstract) GRA

N74-30926* Boeing Co., Seattle, Wash.
TITANIUM HONEYCOMB STRUCTURE
R. A. Davis, S. D. Elrod, and D. T. Lovell *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 21 p (For availability see N74-30922 20-15)
CSCL 01C

N74-30955* Grumman Aircraft Engineering Corp., Bethpage, N.Y.
FASTENING ON THE F-14A FOR COST EFFECTIVE FATIGUE RESISTANCE
Bernard H. Beal *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 20 p refs (For availability see N74-30922 20-15)
CSCL 01C

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment: Nuclear Engineering; and 28 Propulsion Systems.

N74-30444# RAND Corp., Santa Monica, Calif.
SOME COMMENTS ON CONSERVATION IN THE USE OF ENERGY
Deane N. Morris Apr. 1974 26 p Presented at the 39th GAMA Ann. Meeting, San Diego, Calif.
(P-5231) Avail: NTIS HC $4.50

Energy supply and demand in California are discussed. Suggestions are made concerning the efficient utilization of energy resources. Tabulated data are included. E.J.O.

N74-30445*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSPORT DYNAMICS OF A HIGH-POWER-DENSITY MATRIX-TYPE HYDROGEN-OXYGEN FUEL CELL
Paul R. Prokopius and Norman H. Hagedorn Washington Aug. 1974 19 p refs
(NASA-TN-D-7757; E-7876) Avail: NTIS HC $3.00 CSCL 10A

Experimental transport dynamics tests were made on a space power fuel cell of current design. Various operating transients were introduced and transport-related response data were recorded with fluidic humidity sensing instruments. Also, sampled data techniques were developed for measuring the cathode-side electrolyte concentration during transient operation. Author

N74-30446# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
CRYOGENIC H2 AND NATIONAL ENERGY NEEDS
J. Hord 10 Aug. 1973 24 p refs Presented at the Cryogenic Eng. Conf., Atlanta, 8-10 Aug. 1973
(Paper-N-1) Avail: NTIS HC $4.25

National and world energy shortages are briefly summarized to demonstrate the relevance of synthetic fuels in satisfying future energy markets. A perspective of national energy needs, as they relate to cryogenic hydrogen fuel, is given. Hydrogen and alternate synthetic fuels are briefly reviewed and potential applications for cryogenic hydrogen are described. Technical research and development efforts, required to satisfy specific current and future national needs, are identified. The mechanism for implementation of synthetic fuels and the indistinct timetable for transition to these fuels are discussed. Author

N74-30447# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
SUPERCONDUCTING ELECTRICAL GENERATORS FOR CENTRAL POWER STATION USE
T. M. Flynn, R. L. Powell, D. B. Chelton, and B. W. Birmingham 10 Aug. 1973 16 p Presented at the 1973 Cryogenic Eng. Conf. Atlanta, 8-10 Aug. 1973
(Paper-M4) Avail: NTIS HC $4.00 CSCL 10B

Superconductivity applied to electrical generator machine design was investigated in an effort to find a more efficient means of electrical energy production. The specific needs of the commercial, manufacturer, and user sectors in relation to development of the technology were documented. The results of the following three preliminary studies are reported: (1) a market appraisal and economic analysis to assess commercial potential and economic impact, including the beneficial effect on import/export balance of trade; (2) applications of superconducting machinery to determine future machinery needs of the electric power industry; and (3) technical problem identification to determine the critical components, materials, and systems, and suggest an appropriate research and development program. Actual experimental construction was precluded because of a lack of funds. Author

N74-30448*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH VOLTAGE, HIGH CURRENT SCHOTTKY BARRIER SOLAR CELL Patent Application
Richard J. Stirn, inventor (to NASA) (JPL) Filed 5 Aug. 1974 15 p
(Contract NAS7-100)
(NASA-Case-NPO-13482-1; US-Patent-Appl-SN-495021) Avail: NTIS HC $4.00 CSCL 10A

A Schottky barrier solar cell is described which consists of a layer of wide band gap semiconductor material on which a very thin film of semi-transparent metal is deposited to form the barrier. The layer of the wide band gap semiconductor material is on top of a layer of narrower band gap semiconductor material, to which one of the cell's contacts may be attached directly, or through a substrate. The cell's other contact is a grid structure which is deposited on the thin metal film. NASA

N74-30449*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PERFORMANCE OF FINNED THERMAL CAPACITORS Ph.D. Thesis - Texas Univ., Austin
William R. Humphries Washington Jul. 1974 324 p refs
(NASA-TN-D-7690) Avail: NTIS HC $7.25 CSCL 09A

The performance of typical thermal capacitors, both in earth and orbital environments, was investigated. Techniques which were used to make predictions of thermal behavior in a one-g earth environment are outlined. Orbital performance parameters are qualitatively discussed, and those effects expected to be important under zero-g conditions are outlined. A summary of thermal capacitor applications are documentated, along with significant problem areas and current configurations. An experimental program was conducted to determine typical one-g performance, and the physical significance of these data is discussed in detail. Numerical techniques were employed to allow comparison between analytical and experimental data. Author

N74-30450# Stanford Univ., Calif.
EFFECT OF CARBON DIOXIDE ON ELECTRODE VOLTAGE FALL ON MHD GENERATOR PERFORMANCE Interim Report
Gary Arnold DuBro Oct. 1973 90 p refs
(Contracts F44620-73-C-0045; F33615-72-C-1088; AF Proj. 6813; AF Proj. 9752)
(AD-779698; SU-IPR-565; AFOSR-74-0776TR) Avail: NTIS CSCL 10/2

A series of experiments were performed to investigate the effect of carbon dioxide concentration on electrode voltage fall in a simulated MHD generator with an argo-carbon dioxide-potassium plasma. It was observed that increases in carbon dioxide addition resulted in very significant increases in electrode voltage drops. The electrode fall increased with the increase of carbon dioxide concentration, the increase of applied current, and the decrease in electrode temperature. Further, the voltage drops were larger at the cathode than at the anode. Experimental electrical conductivities were also reported. Electric fields were applied with a resulting maximum transverse current density of 0.500 amps/cm squared; molecular additions of up to 5% were injected into the stream. A theoretical model for the electron number density and electric potential was postulated and the results were compared with experimental electsrode voltage drops. (Modified author abstract) GRA

N74-30451# Wyoming Univ., Laramie. Water Resources Research Inst.
COAL-ENERGY DE'ELOPMENT IN THE NORTHERN GREAT PLAINS
Jack R. Davidson Oct. 1973 137 p Prepared in cooperation with North Dakota State Univ. and Montana State Univ., Bozeman Sponsored by the Office of Water Resources Research
(PB-231560/4; OWRR-B-024-WYO(1); W74-07056) Avail: NTIS HC $4.75 CSCL 13B

The growth demand for clean energy has focused attention on western coals, particularly the extensive lignite and subbituminous deposits in the Northern Great Plains. The Fort Union Powder River Coal beds, which underlie a large part of northern Wyoming, southeastern Montana and western North Dakota offer the greatest potential for development, because of the vast quantities of coal which can be strip mined. The U.S. Government has undertaken to assess coal/energy development problems through the Northern Great Plains Resources Program (NGPRP). The Water Resource Research Institutes of the three-state area, together with the Office of Water Resources Research, undertook the following tasks; to determine the study needs, to inventory current research efforts and to assess their potential contribution, to establish the priorities for study as seen by the decision makers in the three states, and to assess the capacity of the region's scientists to carry out the needed studies. Eight categories for study were identified; trace elements; atmospheric effects; surface resources (including reclamation); coal resources and mining techniques; water (including water quality); economic and social issues; institutional and legal issues; and technology development. GRA

N74-30452# National Aviation Facilities Experimental Center, Atlantic City, N.J.
SIMULATED IN-FLIGHT FIRE TEST ON A SELF-GENERATING OVERHEAT DETECTION SYSTEM Summary Report, Sep. - Oct. 1972
Richard G. Hill Mar. 1974 25 p refs
(Contract F33615-73-M-2009; AF Proj. 3048)
(AD-779820; AFAPL-TR-73-70) Avail: NTIS CSCL 01/2

Tests under simulated flight conditions were conducted on a self-generating overheat detection system installed in a C-140 airplane engines nacelle. They were run with the system in its normal configuration and also with a section of the detection cable pinched, opened, and shorted. The system was monitored for fire response time as well as for false alarms. The system performed well in its normal, pinched and opened, configurations, but the alarm time was increased by over 100% when the cable was shorted. No false alarms were noted during testing.
Author (GRA)

N74-30453# Air Force Academy, Colo. Frank J. Seiler Research Lab.
TRAILING WIRE SYSTEM APPLIED RESEARCH Final Report, Mar. 1972 - Apr. 1974
Henry E. Keck Apr. 1974 54 p refs
(AF Proj. 7904)
(AD-778678; SRL-TR-74-0007) Avail: NTIS CSCL 13/5

Analytical investigations into the physics of trailing long cables from fixed wing aircraft with the intent of establishing the practicality of long range, rapid reaction time, man rescue systems were conducted. A prototype system capable of towing loads up to 500 pounds at reel rates of 1000 feet per minute and with cable lengths up to 20,000 feet, was built and instrumented by personnel in the Department of Civil Engineering, Engineering Mechanics and Materials, Air Force Academy Co. The system was flight tested on board a C-130B aircraft at El Centro NAS Ca. Tactics for deployment of the cable system over the ground target were developed and system operation data was collected during the flight test program. Data verifying the acceptability of the mathematical model was obtained, subsequent flight test requirements to determine operational capabilities are defined, and probable roles for the trailing wire system in the areas of long range man rescue as well as deployment of low altitude terrain surveillance equipment are established.
Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-30454 British Library Lending Div., Boston Spa (England).
ASSESSING THE ABUNDANCE AND BIOMASS OF PHYTOPLANKTON BY MEANS OF ELECTRONIC COMPUTERS
E. I. Aksenova and V. I. Poltinnikov Mar. 1974 19 p refs Transl. into ENGLISH from Tr. Vses. Nauch.-Issled. Morsk. Ryb. Khoz. Okeanogr. (USSR), v. 89, 1972 p 209-226
(BLL-RTS-8914) Avail: British Library Lending Div., Boston Spa, Engl.: 6 BLL photocopy coupons

The geometrical approximations used to create a computer program for the evaluation of phytoplankton biomass in the Asov Sea are presented. The selection of 47 geometrical figures representing the 496 principal algae which occur in the Asov basin served as a basis for the creation of a computer code, and also provided a standard method for comparing the data to previous research. The program algorithm used to assess the biomass by genera, species, division, and total mass is explained for each of its four successive operations. Examples of initial data are given, and preliminary results are shown in tabular form. A.A.D.

N74-30455 Ohio State Univ., Columbus.
A THEORETICAL STUDY OF GAITS FOR LEGGED LOCOMOTION SYSTEMS Ph.D. Thesis
Shu-Shen Sun 1974 164 p
Avail: Univ. Microfilms Order No. 74-17811

A fundamental research area in the study of natural or artificial legged locomotion systems is the investigation of time sequences (or gaits) for the placing and lifting of the legs of an animal or machine during its motion. Gaits for biped and quadruped systems have been studied. Compared to the possible gaits for systems with six or more legs, biped and quadruped systems are relatively simple to analyze and some useful and concrete results have been derived by previous investigators. It has been found that the theoretically possible number of gaits is surprisingly large as the number of legs is increased, and the need for more formal and systematic means of analysis has been recognized. This research is aimed at the development of a general method to reduce the combinatorial complexity of gait analysis by making use of certain concepts of equivalence classes of gaits, and to then use these classes for the study of optimal gaits which provide the greatest degree of system stability. Dissert. Abstr.

N74-30456 British Library Lending Div., Boston Spa (England).
HOW SPACE MEDICINE HELPS TERRESTRIAL
N. Gurovsky and A. Yegorov 17 Jan. 1974 5 p Transl. into ENGLISH from Izvestia (USSR), 4 Jan. 1974
(BLL-M-23364-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Applications of space medicine to clinical practices are briefly discussed for biotelemetry. F.O.S.

N74-30457 British Library Lending Div., Boston Spa (England).
GRAVITATIONAL BIOLOGY
N. Dubinin 1 Feb. 1974 4 p Transl. into ENGLISH from Pravda (USSR), 6 Jan. 1974
(BLL-M-23358-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The effects of gravitation on organisms on the earth surface and in weightless environments are discussed with emphasis on the effect of space flight on genetic structures and the resulting mutations. F.O.S.

N74-30458*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 130, JULY 1974
Jul. 1974 87 p refs
(NASA-SP-7011(130)) Avail: NTIS HC $4.00 CSCL 06E

This special bibliography lists 291 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1974. Author

N74-30459 British Library Lending Div., Boston Spa (England).
BIOLOGIST'S QUESTIONS TO SPACE
A. Burnazyan [1974] 5 p Transl. into ENGLISH from Pravda (USSR), 9 Nov. 1973
(BLL-M-23267-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The importance of biological research in conjunction with space exploration is discussed. Current studies in the U.S.S.R., with particular reference to Cosmos 605, are outlined. Attention is given to questions pertaining to the role of the force of gravity in the functioning of living systems, the origin and nature of biological rhythms, biomagnetism, and the adaptation of living organisms to prolonged states of weightlessness. A.A.D.

N74-30460# British Library Lending Div., Boston Spa (England).
PHOTORESPIRATION AND THE PRIMARY REACTIONS OF PHOTOSYNTHESIS
B. Loetsch [1974] 22 p refs Transl. into ENGLISH from Ber. Deut. Bot. Ges. (West Germany), v. 83, no. 2, 1970 p 41-54
(BLL-DRIC-Trans-3293-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Under suitable experimental conditions, it is possible to demonstrate a light-dependent carbon dioxide production (and oxygen consumption) in higher plants. This so-called photorespiration is not connected with mitochondrial respiration (which seems to be even inhibited in light), but is closely related to the primary reactions of photosynthesis. To clarify this connection with the light driven electron flow, a comparative biological demonstration of the much discussed two quantum scheme of photosynthesis is presented. As a result, it is not clear that an automatic coupling of the photochemical splitting of water (to produce reduction energy) with the non-cyclic photo-phosphorylation (to gain energy as ATP) has emerged in the course of biological evolution. Author

N74-30461*# California Univ., Davis. Dept. of Animal and Human Physiology.
CORRELATION OF HIPPOCAMPAL THETA RHYTHM WITH CHANGES IN CUTANEOUS TEMPERATURE
J. M. Horowitz, M. A. Saleh, and R. D. Karem [1974] 25 p refs
(Grants NGR-05-004-099; NGL-05-004-031; HO-6686)
(NASA-CR-139527) Avail: NTIS HC $4.25 CSCL 06C

A possible role for the hippocampus in alerting an animal to changes in cutaneous temperature was examined. Following local warming or cooling of the ears of unanesthetized, loosely restrained rabbits, theta waves (4-7 Hz EEG waves) were recorded from electrodes straddling the hippocampus. The onset of the hippocampal theta rhythm was correlated with changes in cutaneous temperature, an observation consistent with studies indicating that the theta rhythm is a nonspecific response evoked by stimulation of several sensory modalities. Additional data from cats and rabbits were correlated with specific neurons within the hippocampus, namely pyramidal cells. Post stimulus time histograms obtained by excitation of the dorsal fornix were interpreted in terms of excitatory and inhibitory inputs to pyramidal cells. Thus, the theta rhythm, which appears to be evoked by changes in cutaneous temperature, can be related to a specific type of hippocampal neuron which is in turn connected with other areas of the brain involved in temperature regulation. Author

N74-30462*# California Univ., Davis. Dept. of Human and Animal Physiology.
CORRELATION OF THE HIPPOCAMPAL THETA RHYTHM TO CHANGES IN HYPOTHALAMIC TEMPERATURE Final Technical Report
M. A. Saleh, J. M. Horowitz, and Arnold C. L. Hsieh [1974] 26 p refs
(Grants NGL-05-004-099; NGL-05-004-031; HO-6686)
(NASA-CR-139526) Avail: NTIS HC $4.50 CSCL 06C

Warming and cooling the preoptic anterior hypothalamic area in awake, loosely restrained rabbits was found to evoke theta rhythm. This is consistent with previous studies indicating that

theta rhythm is a nonspecific response evoked by stimulation of several sensory modalities. Several studies have correlated theta rhythm with alertness. A neural pathway involving the hypothalamus, the hippocampus, the septal area, and the reticular formation is proposed. Thus, a role of this pathway may be to alert the animal to changes in its body temperature. Author

N74-30463*# Saad (Geti), Karachi (Pakistan).
PERIODIC (SEASONAL AND YEARLY) CHANGES IN THE ORGANISM OF RATS: THEIR CAUSES AND EFFECTS
N. I. Kalabukhov Washington NASA Aug. 1974 612 p refs Transl. into ENGLISH of the book "Periodicheskiye (Sezonnyye i Godichnyye) Izmeneniya v Organizme Gryzunov: Ikh Prichiny i Posledstviya" Leningrad, Nauka Press, 1969 p 1-249 Sponsored in part by NASA
(Grant NSF C-505)
(NASA-TT-F-14101) Avail: NTIS HC $33.75 CSCL 06C

Data are presented about the changes in forest, steppe, and desert rodents of various species, which take place in different seasons of the year under the influence of external conditions. The adaptation significance of these changes is discussed. This knowledge about the seasonal changes in the rodents will help in controlling rodents. Author

N74-30464*# Saad (Geti), Karachi (Pakistan).
ECOLOGICAL PHYSIOLOGY OF ANIMALS
A. D. Slonim Washington NASA Aug. 1974 693 p refs Transl. into ENGLISH of the book "Ekologicheskaya Fiziologiya Zhivotnykh" Moscow, Vysshaya Shkola Press, 1971 p 1-448
(Contract NSF C-505)
(NASA-TT-F-14203) Avail: NTIS HC $37.75 CSCL 06C

Physiological adjustments, in higher organisms, to the factors of the natural environment were studied along with the micro-evolution of functions. The adaptation of the organism was investigated at various levels of physiological integration related to the reaction of the organism. Separate functions were examined for the appearance of modifications resulting from genetics, or in the individual span of life. Topics discussed include: the mechanisms of physiological natural adaptation, inherited and acquired behavior, periodical changes of physiological processes, temperature effects of the habitat, adaptation to food supply, movement in the environment, and herd and population relations. F.O.S.

N74-30465*# Kanner (Leo) Associates, Redwood City, Calif.
THE ENERGY ASPECT OF THE MECHANISM OF ENZYME ACTION
J. Tonnelat Washington NASA Aug. 1974 34 p refs Transl. into ENGLISH from Biochimie (France), v. 56, 1974 p 21-34
(Contract NASw-2481)
(NASA-TT-F-15835) Avail: NTIS HC $4.75 CSCL 06A

The nature of the phenomena responsible for the need for activation energy in a chemical reaction is examined. These phenomena basically result from electrostatic interactions, and there is no way to decrease the total work required to overcome these interactions, but work can be supplied in several steps. The fractioning of a reaction induced by the intervention of an enzyme substantially accelerates its rate due to the exponential decrease in the number of molecules with their energy level of thermal agitation. An example is given for arbitrary free activation energy values. The chief function of an enzyme is to ensure satisfactory coordination of successive steps. Author

N74-30466*# Kanner (Leo) Associates, Redwood City, Calif.
STUDY OF ANTINUCLEAR ANTIBODIES IN SUBJECTS WITH PHOTODERMATITIS
F. Ippolito and P. G. Natali Washington NASA Aug. 1974 5 p Transl. into ENGLISH from G. Ital. Dermatol. (Italy), v. 109, no. 2, 1974 p 124-125
(Contract NASw-2481)
(NASA-TT-F-15844) Avail: NTIS HC $4.00 CSCL 06P

Recent studies have shown that it is possible to elicit in experimental animals an antibody response to molecules of nucleic acids irradiated with ultraviolet light. The antibodies obtained show an elective specificity for the photoproducts of the thymic base of deoxyribonucleic acid. The use of these antibodies in indirect immunofluorescence methods has been a valuable aid in studying the effects of ultraviolet irradiation on animals exposed in vivo to such radiant energies. It was ascertained that the nuclei of the cutaneous cells of animals exposed to ultraviolet light undergo a temporary denaturation, which can be revealed with the use of antisera specific for UV-DNA. Author

N74-30467*# Linguistic Systems, Inc., Cambridge, Mass.
EVOLUTION OF THE GRAVIRECEPTOR AND ITS INVESTIGATION UNDER CONDITIONS OF ACCELERATION AND WEIGHTLESSNESS
Ya. A. Vinnikov Washington NASA Jul. 1974 38 p refs Transl. into ENGLISH from Arkh. Anatomii, Gistol. i Embriol. (USSR), v. 66, no. 1, 1974 p 10-25
(Contract NASw-2482)
(NASA-TT-F-15574) Avail: NTIS HC $5.00 CSCL 06C

Previous work conducted on the evolution of the mechanism of gravity reception in invertebrates and vertebrates. The structure of this mechanism in various organisms from protozoa to mollusks and crabs is described by means of numerous electron microscopic photographs. According to the analysis, this structure was retained in the vertebrates, and developed apparently in direct relation to the complexity of their muscular structure and interrelation with the earth's gravity. The effects of linear acceleration and weightlessness on its development are discussed; linear accelerations of 10 g for three minutes were created to stimulate utriculus receptor cells and those of the sacculus and semicircular canals, with considerable alterations in nuclear and cytoplasmic organization being observed. Experiments done on Soyuz-10 are described. Author

N74-30468*# Kanner (Leo) Associates, Redwood City, Calif.
MEAN LUNG CAPACITY UNDER INCREASED O2 DEMAND
E. Asmussen and E. H. Christensen Washington NASA Aug. 1974 12 p refs Transl. into ENGLISH from Skand. Arch. Physiol., (Denmark), v. 82, 1939 p 201-212
(Contract NASw-2481)
(NASA-TT-F-15598) Avail: NTIS HC $4.00 CSCL 06P

The respiration of four subjects exercising on a bicycle ergometer was studied in a steady state both at atmospheric pressure and at reduced pressure and compared with respiration at rest. In contrast to the opinions of several earlier researchers, no general increase in mean capacity was found during work. Verzar's hypothesis of a third form of regulation thus appears to be incorrect. Author

N74-30469*# Linguistic Systems, Inc., Cambridge, Mass.
THE INFLUENCE OF A ZERO-CALORIE DIET ON CARDIAC PERFORMANCE IN OVERWEIGHT WOMEN WITH NORMAL CIRCULATORY SYSTEMS
K. Bolzano, H. J. Lisch, A. Aigner, F. Sandhofer, and S. Sailer Washington NASA Jun. 1974 17 p refs Transl. into ENGLISH from Wien. Klin. Wochenschr. (Austria), v. 85, Oct. 1973 p 667-661
(Contract NASw-2482)
(NASA-TT-F-15711) Avail: NTIS HC $4.00 CSCL 06P

Fasts of two weeks are employed to reduce overweight in 9 obese, but otherwise healthy women. Before treatment and at the end of the first and second week of total starvation, serum electrolytes, total serum protein, and acidbase status were measured. The ejection fraction and index of myocardial contractility were calculated based on systolic time intervals. During starvation significant reduction in left ventricular ejection time was observed as well as prolongation of pre-ejection period and external isovolumic contraction time. After two weeks significant reduction in ejection fraction occurred and the index of myocardial contractility was significantly depressed. The serum K+ concentration shifted to lowered values. It is suggested that total therapeutic starvation of relatively short duration may cause reduction in myocardial contractility of the left ventricle. Author

N74-30470*# Scientific Translation Service, Santa Barbara, Calif.
ON THE QUESTION OF PILOT DETERIORATION DURING LOW ALTITUDE FLIGHT
P. Schulz Washington NASA Jul. 1974 20 p refs Transl. into ENGLISH from the German report DLR-Mitt-70-12 Presented at the meeting of the DGLR Sci. Comm. on Flight Performance and Flight Characteristics, Darmstadt, 12-13 Nov. 1970
(Contract NASw-2483)

(NASA-TT-F-15799; DLR-Mitt-70-12) Avail: NTIS HC $4.00 CSCL 06S

The problem of pilot performance estimates during the aircraft design phase is discussed. The following are found to influence such estimates: low altitude turbulence model, aircraft model, mission model and pilot response model. Pilot responses to stochastic gust disturbances are evaluated and the aircraft transfer functions are calculated. Flight controllers are needed for low altitude flight. Elastic degrees of aircraft motion should be included in the calculation. Author

N74-30471*# Techtran Corp., Glen Burnie, Md.
PREDICTING RESISTANCE TO G-FORCES BY THE AID OF A DECOMPRESSION FUNCTIONAL TEST
V. G. Voloshin, P. M. Suvorov, A. R. Kotovskaya, and R. A. Vartbaronov Washington NASA Jul. 1974 9 p Transl. into ENGLISH from Voyenno-Med. Zh. (USSR), no. 5, May 1974 p 56-59
(Contract NASw-2485)
(NASA-TT-F-15823) Avail: NTIS HC $4.00 CSCL 06S

An examination was made of the suitability of a method of decompressing the lower half of the body for the purpose of determining pilot's resistance to positive g-forces. Data are introduced on the correlation between resistance to positive g-forces and findings of the decompression studies. It is found that decompression can serve as a good method of determining resistance to g-forces if some shortcomings are eliminated and a further study is made for the exact degree of coincidence of resistance levels according to the two methods. Author

N74-30472*# Scientific Translation Service, Santa Barbara, Calif.
RESPIRATORY AND RIGHT HEART FUNCTION IN DIFFERENT TYPES OF OBESE PATIENTS
J. Meunier-Carus, E. Lampert, J. Lonsdorfer, D. Kurtz, and G. Micheletti Washington NASA Aug. 1974 30 p refs Transl. into ENGLISH from Bull. Physio-Pat-hol. Resp. (France), v. 8, 1972 p 915-935
(Contract NASw-2483)
(NASA-TT-F-15827) Avail: NTIS HC $4.50 CSCL 06P

Eighty seven parameters of respiratory and right heart function, obtained either by direct measurement or by calculation, were measured in 63 obese patients and in a group of 17 nonobese bronchitics, the latter being used for comparative purposes. The obese patients were divided into groups according to the presence or absence of sleep disorders, the presence or absence of alveolar hypoventilation or the presence of chronic bronchitis. Twenty-nine of the parameters studied showed statistical and physiologically significant differences between the groups of obese patients, permitting the definition of a physiopathological profile for each one. This profile was characterized by specific elements relating to ventilation, gas exchange, ventilation/perfusion distribution and right-sided cardio-circulatory function. These pathophysiological labels, particular to each type of obesity, were largely determined by the presence and dominant action of the mechanism of thoracic mechanics peculiar to each. The importance in obesity of ventilatory and mechanical problems, gas exchange and ventilation/perfusion distribution, as well as of rightsided cardiac haemodynamics, are also discussed in the light of the findings. Author

N74-30473*# Kanner (Leo) Associates, Redwood City, Calif.
TREATMENT OF SYSTEMIC LUPUS ERYTHEMATOSUS WITH AZATHIOPRINE
E. Sharon Washington NASA Aug. 1974 7 p refs Transl. into ENGLISH from Harefuah (Tel Aviv), v. 86, no. 7, 1974 p 382-384
(Contract NASw-2481)
(NASA-TT-F-15840) Avail: NTIS HC $4.00 CSCL 06E

A brief history of experiments on the use of azathioprine in the treatment of patients with systemic lupus erythematosus with kidney involvement has demonstrated azathioprine's effectiveness. Azathioprine has two main characteristics: immunologic and cytotoxic depression activity and anti-inflammation activity. In dosages of 2.5 mg/kg/day, azathioprine is tolerated well by patients, producing few side effects, possible depression of the marrow which is easily reversible, and no exhibition of teratogenic changes. Used in conjunction with steroids, it allows a reduction in steroid dosage, thereby reducing toxic side effects of the steroids. Discontinuation must be gradual to avoid aggravation of the disease. Author

N74-30474*# Techtran Corp., Glen Burnie, Md.
ADAPTATION AS A FACTOR MODIFYING THE STABILITY OF ENZYMES
V. I. Maksimov Washington NASA Apr. 1974 21 p refs Transl. into ENGLISH from Usp. Sovrem. Biol. (Moscow), v. 76, no. 1 (4), 1973 p 21-33
(Contract NASw-2485)
(NASA-TT-F-15505) Avail: NTIS HC $4.25 CSCL 06D

Materials published chiefly in recent years on the features of the stability of thermophilic, halophilic, and other enzymes are surveyed. It has recently become possible to analyze the question of genetic control of enzyme stability at the molecular level (level of enzyme molecular structure). Although study of the mechanism of adaptation of enzyme stability to cell existence conditions is not complete, extant enzymological experimental materials permit the making of certain adjustments in the concept of the general mechanisms of enzyme stability. As an example, the theory of hydrophobic interaction cannot explain the variability observed in enzyme stability. The data assembled on the exceptional stability of a number of enzymes may be of value for laboratory and industrial derivation and use of enzymes. Author

N74-30475*# North Texas State Univ., Denton. Dept. of Biological Sciences.
ALTERATIONS IN CELLULAR AND METABOLIC PROCESSES Final Report
Tom D. Rogers Aug. 1974 69 p refs
(Grant NGR-44-027-005)
(NASA-CR-139398) Avail: NTIS CSCL 06M

Results of the use of specialized instrumention to obtain specific biochemical and morphological information is reported. The research reported includes: alteration in cellular and metabolic processes, microspectrophotometric analysis of the cell cycle, cytophotometry of virus-infected culture cells, rapid scanning microspectrophotometry of colorless Euglena gracilis and Astasia longa, and the intracellular quantitation of lactate dehyrogenase in colorless Euglena gracilis and Astasia longa. F.O.S.

N74-30476*# Illinois Univ., Urbana. Dept. of Civil Engineering.
TOPOGRAPHY OF AORTIC HEART VALVES Final Report
H. M. Karara 1 Aug. 1974 38 p refs
(Contract NAS9-12459)
(NASA-CR-139566; UILU-ENG-74-2017) Avail: NTIS HC $5.00 CSCL 06P

The cooperative effort towards the development of a tri-leaflet prosthetic heart valve is described. The photogrammetric studies were conducted on silicone rubber molds. Information on data acquisition and data reduction phases is given, and certain accuracy aspects of the project are explained. The various outputs which are discussed include digital models, profiles, and contour maps. Author

N74-30477*# Hardin-Simmons Univ., Abilene, Tex. Dept. of Biology
A STUDY OF PSYCHROPHILIC ORGANISMS ISOLATED FROM THE MANUFACTURE AND ASSEMBLY AREAS OF SPACECRAFT TO BE USED IN THE VIKING MISSION Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
Terry L. Foster Jul. 1974 37 p
(Grant NGR-44-095-001)
(NASA-CR-139390; SAPR-4) Avail: NTIS HC $5.00 CSCL 06M

The effect of storage of dry heat treated Teflon ribbons under nitrogen gas followed by high vacuum on the recovery of hardy organisms from the ribbons was studied. A similar experiment was performed on spore crops of hardy organisms recovered previously from Cape Canaveral. Hardy organisms have been inoculated onto slides and subjected to an artificial Martian environment in an attempt to demonstrate their growth in this environment. Additional experiments using the artificial Martian environment include response of soil samples from the VAB with both constant temperature and freeze-thaw cycles. These experiments were performed with dried soil and soil containing

added water. Other investigations included the effect of heatshock on soil samples, psychrophilic counts of new soil samples from the manufacture area of the Viking spacecraft, effect of pour plate versus spread plate on psychrophilic counts, and preparation of spore crops of hardy organisms from Cape Canaveral. Author

N74-30478# Joint Publications Research Service, Arlington, Va.
ELECTROMAGNETIC SIGNALING IN ANIMATE NATURE
A. S. Presman 10 Jul. 1974 68 p refs Transl. into ENGLISH of the book "Elektromagnitnaya Signalizatsiya v Zhivoy Prirode" USSR, Izdatekstvo Sovetskoye Radio, 1974 p 1-63
(JPRS-62434) Avail: NTIS HC $6.50

One of the prospective new areas in biology arising and rapidly developing in the past decade is the problem of electromagnetic signalling in animate nature which uses a broad range of the spectrum from infralow to superhigh frequencies for information communications. Basic empirical data and theoretical arguments are reviewed indicating the existence of electromagnetic signalling in the range of the spectrum on all levels of organization of the animate world -- from molecular to the biosphere. Author

N74-30479*# Minnesota Univ., Minneapolis. Dept. of Microbiology.
FLUORESCENT ANTIBODY DETECTION OF MICROORGANISMS IN TERRESTRIAL ENVIRONMENTS Final Report, 1 Jul. 1970 - 31 Dec. 1972
Edwin L. Schmidt 31 Dec. 1972 5 p refs
(Grant NGR-24-005-198)
(NASA-CR-139386) Avail: NTIS HC $4.00 CSCL 06M

The fluorescent antibody technique and its use in direct microscopic examination of the soil is discussed. Feasibility analyses were made to determine if the method could be used to simultaneously observe and recognize microorganisms in the soil. Some data indicate this may be possible. Data are also given on two related problems involving the interaction of soil microorganisms with plant roots to form symbiotic structures. One was concerned with the developmental ecology and biology of the root nodule of alder and the second was concerned with the ectotrophic mycorrhizal structure on forest trees, especially pines. In both, the fluorescent antibody detection of the microbial symbiont both as a free living form in soil, and as a root inhabiting form in the higher plant was emphasized. A third aspect of the research involved the detection of autotrophic ammonia oxidizing microorganisms in soil. Author

N74-30480*# Food and Drug Administration, Cincinnati, Ohio. Food Research Lab.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
J. E. Campbell Jun. 1974 22 p
(NASA Order W-13411)
(NASA-CR-139485; QPR-36) Avail: NTIS HC $4.25 CSCL 06M

The uses of scanning electron microscopy in assessing changes that occur in spores exposed to wet and dry heat cycles at elevated temperatures were examined. Several species of Bacillus and other nonspore-forming species of organisms were used for the experiment. Surface morphology of viable and nonviable organisms was clearly detectable by this method, making it a potentially useful technique for investigating microbial inactivation on space vehicle surfaces and components. Micrographs of the spores and bacterial cells are provided. A.A.D.

N74-30481*# Utah State Univ., Logan.
PLANT ADAPTATION TO COLD. 1: CHLOROPHYLL 2: MINERALS M.S. Thesis
Peter Rosen 1972 80 p refs
(Grant NGR-45-002-008)
(NASA-CR-139528) Avail: NTIS HC $7.00 CSCL 06C

A number of montane herbs in northern Utah typically form flower buds beneath the snow cover and flower either through it or immediately after its recession. Two of these species, one naturally occurring, Claytonia lanceolata, and one cultivated bulb, Galanthus nivalis, were investigated for their response to this stress environment. Snow depth patterns, chlorophyll content of tissues, and plants grown in light-tight boxes, suggest that light passing through the snow to reach plants growing underneath is not critically involved in the timing of their developmental cycles or in their ability to endure this low temperature environment. Ability to endure stress seems to be closely related in a number of ways to activity at the plant membranes. Plants were protected from low temperature damage by application of cytokinin or calcium, both of which probably acted at the membrane. Potassium calcium antagonisms were reflected in the internal distribution of the ions under natural stress conditions; and plants that differentiated at the meristem while growing through the snow accumulated calcium at the tip during this growth. Author

N74-30482# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany).
THE CATECHOLAMINE AND 17-HYDROXYCORTICOIDEXCRETION OF FIVE AQUANAUTS DURING THEIR STAY IN THE UNDERWATERLABORATORY TEKTITE 2
H. Oser and H.-M. Wegmann 1974 27 p refs In GERMAN; ENGLISH summary
(DLR-FB-74-02) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 11,40 DM

Studies were performed on five aquanauts of the U.S. underwaterlaboratory Tektite 2 during their 14-day-stay in a high pressure environment by analyzing the urinary excretion of catecholamines and 17-hydroxycorticosterioids (17-OHCS). The results showed a distinct increase of both the catecholamines and the 17-OHCS. Though the rythm of life was shifted the excretion of noradrenaline and 17-OHCS showed a stable circadian pattern whereas adrenaline was shifted by about 8 hours towards the night. The increased excretion rates indicate a stress situation which was caused by many dives and the life in an underwater habitat. ESRO

N74-30483# Pennsylvania State Univ., University Park. Center for Air Environment Studies.
INFLUENCE OF ALTERED GASEOUS ENVIRONMENTS ON LUNG METABOLISM Interim Progress Report, 1 Jun. 1973 - 31 May 1974
Rodney A. Rhoades Mar. 1974 25 p refs
(Grant AF-AFOSR-2559-73; AF Proj. 9777)
(AD-779048; CAES-1; AFOSR-74-0752TR; IPR-1) Avail: NTIS CSCL 06/19

To date, the main findings of this investigation indicate the acute hypoxic stress (1.5 hr. to PO2 34mmHg) does not markedly accelerate glucose uptake, decrease lipid synthesis, deplete tissue glycogen, or shut down citric acid cycle activity with a concomitant decrease in glucose and fatty acid oxidation; effects commonly seen in other organs. Thus, the lung appears to be more resistant to hypoxic stress. Finally, exposure to hyperoxia for 1.5 hr. has little detrimental effect on the metabolic process of the lung. Author (GRA)

N74-30484# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CHARACTERISTICS OF THE AVERAGE HUMAN VISUAL EVOKED RESPONSE (VER) M.S. Thesis
David J. Irwin Mar. 1974 115 p refs
(AF Proj. 7184)
(AD-779079; GE/BE/74-7) Avail: NTIS CSCL 05/10

Apparatus and procedure were designed to present subjects with point-source visual stimuli in the 50-75% threshold range and to record their psychophysical and physiological responses. A total of six subjects were tested using a forced choice testing procedure. The data obtained from the experiment consisted of over 3600 single-trial EEG records one-half second in length. A group analysis of the data was accomplished, and a computer program was developed to identify whether or not the stimulus was perceived in each EEG record. The computer analysis is based on a filtered Fourier transform identification technique developed by the Air Force Institute of Technology and the Aerospace Medical Research Laboratory. The results of the computer analysis were compared with the subject's psychophysical responses to calculate the probability of detection. (Modified author abstract) GRA

N74-30485# State Univ. of New York, Brockport. Dept. of Biology.
THE DEGRADATION OF OIL IN CONTINUOUS CULTURE Annual Report, 1 Sep. 1972 - 31 Aug. 1973
P. H. Pritchard and T. J. Starr 19 Apr. 1974 82 p refs
(Contract N00014-73-C-0074; NR Proj. 133-070)
(AD-780234; AR-1) Avail: NTIS CSCL 06/13

A continuous culture system has been developed and tested for its usefulness in studying the degradation of oil and hydrocarbons. Both octane and diesel oil have been degraded in this system at measurable rates. Changes in these substrates and in the bacteria attacking them could be readily monitored and characterized. Oil and hydrocarbons could be degraded without mechanical dispersion and continuous culture enrichments were readily obtained as part of the degradation process. Sequential continuous culture systems have also been developed and tested successfully. An artificial oil has been developed to aid in the study of the bacterial mechanisms for degrading oil. A successful fish embryo bioassay has been developed and it has been shown that water extracts of oil and toluene interfere with embryological development. Oil degradation products also interfere with development but in a different manner.
Author (GRA)

N74-30486# Naval Submarine Medical Research Lab., Groton, Conn.
EFFECTS OF REPETITION AND DARK ADAPTATION ON VISUAL EVOKED RESPONSES IN THE RAT Interim Report
Raymond T. Bartus and Steven H. Ferris 1 Feb. 1974 14 p
(MR04101)
(AD-780060; NSMRL-770) Avail: NTIS CSCL 06/16

Rats chronically implanted with monopolar electrodes in the primary visual cortex were used to evaluate progressive changes occurring in the amplitude of visual evoked responses to repeated visual stimuli. It was found that if the rats were dark-adapted prior to testing, no consistent changes occurred in the early components of the evoked response. Without sufficient dark adaptation however, progressive increases in these components were observed. Contrary to these changes, the later evoked response components exhibited reliable changes over trial blocks regardless of whether prior dark adaptation was given. It was concluded that these later-component changes are best explained as correlates of central nervous system habituation. These data may be taken into account in hyperbaric experiments in which the averaged evoked response is used as a measure of neural functioning, thus often alleviating the need for certain costly control conditions; they may provide an additional tool for research programs interested in assessing the effects of hyperbaric environments on simple neurobehavioral processes.
Author (GRA)

N74-30722* Centre for Overseas Pest Research, London (England).
ERTS SURVEYS A 500 km SQUARED LOCUST BREEDING SITE IN SAUDI ARABIA
D. E. Pedgley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 233-246 (For availability see N74-30705 20-13)
(Paper-A15) CSCL 06C

N74-30813* Philco-Ford Corp., Philadelphia, Pa.
AN EVALUATION OF THE USE OF ERTS-1 SATELLITE IMAGERY FOR GRIZZLY BEAR HABITAT ANALYSIS
Joel R. Varney, John J. Craighead (Mont. Univ., Missoula), and Jay S. Sumner (Mont. Univ., Missoula) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1653-1670 refs (For availability see N74-30774 20-13)
(Grant NGR-27-002-006)
(Paper-E11) CSCL 06C

N74-30814* Environmental Research Inst. of Michigan, Ann Arbor.
UTILITY OF ERTS FOR MONITORING THE BREEDING HABITAT OF MIGRATORY WATERFOWL
Edgar A. Work, Jr., David S. Gilmer (Northern Prairie Wildlife Res. Center), and A. T. Klett (Northern Prairie Wildlife Res. Center) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1671-1686 refs (For availability see N74-30774 20-13)
(Paper-E12) CSCL 06C

N74-30846 Joint Publications Research Service, Arlington, Va.
SCIENTIFIC PROJECTS AT PUSHCHINO BIOLOGICAL STUDY CENTER
L. Repetskiy *In its* The Earth's Future and Res. at Pushchino City (JPRS-62356) 1 Jul. 1974 p 13-21 Transl. into ENGLISH from Nauka Zhizn (USSR), no. 4, 1974 p 106-111 (For availability see N74-30844 20-13)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-30487 British Library Lending Div., Boston Spa (England).
VISUAL RANGE OF AN OBJECT IN THE ATMOSPHERE
M. Gazzi and V. Vicentini 4 Feb. 1974 40 p refs Transl. into ENGLISH from the Italian
(BLL-DRIC-Trans-3318-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Briefly demonstrated are the elementary principles which form the basis of vision in the atmosphere. Visual range, elementary theory of vision, attenuation and light of the atmosphere, contrasts threshold, and calculation of visual range are all considered.
Author

N74-30488*# Kanner (Leo) Associates, Redwood City, Calif.
MAN-OPERATOR IN SPACE
Ye. Khrunov, L. Khachaturyants, V. Popov, and Ye. Ivanov Washington NASA Aug. 1974 403 p refs Transl. into ENGLISH of the book "Chelovek-operator v Kosmicheskom Polete" Moscow, Mashinostr. Press, 1974 399 p
(Contract NASw-2481)
(NASA-TT-F-15714) Avail: NTIS HC $23.25 CSCL 05E

The psychological and physiological factors affecting manned space flight were studied. The various psychological factors (tension, fatigue, motivation) and physiological factors (exhaustion, vision, hearing, tactile sensation) are examined as they relate to man's performance in decision-making, perception of information, and problem-solving. The conclusion is reached that man forms a vital link in the control system of spacecraft and, in certain respects, performs inherently better than purely automated systems. THe various applications of manned space flight are also discussed including agriculture, meteorology, forestry, and mining.
Author

N74-30489*# Northrop Corp., Hawthorne, Calif. Research and Technology Center.
RESEARCH ON THE PROPERTIES OF CIRCADIAN SYSTEMS AMENABLE TO STUDY IN SPACE Final Report
R. G. Lindberg and P. Hayden Jun. 1974 185 p refs
(Contract NAS2-5037)
(NASA-CR-137523) Avail: NTIS HC $12.25 CSCL 05E

Three areas of inquiry are reported for the Skylab Experiment S-071 whose objective was to study the circadian system of a mammal during space flight. The thermoregulatory behavior of the Perognathus longimembris, or little pocket mouse, was studied under conditions of constant dark and constant temperature in the prolonged weightless environment of Skylab. The following specific questions were studied: (1) the effects of weightlessness on circadian periodicity in the little pocket mouse; (2) stability of the free-running circadian period of body temperature of the little pocket mouse exposed to simulated launch stress; and (3) characteristics of the circadian rhythm of body temperature in the little pocket mouse. Diagrams of the electronic circuitry and hardware used in the experiment are shown and results are given in both graphical and tabular form. The methods used in the experiment are fully documented, along with conclusions and recommendations for future research.
A.A.D.

N74-30490*# Technology, Inc., Houston, Tex. Life Sciences Div.
SKYLAB FOOD SYSTEM LABORATORY SUPPORT Final Report, 1 May 1972 - 30 Jun. 1974
Dennis Sanford 30 Jun. 1974 65 p
(Contract NAS9-12926)
(NASA-CR-134380) Avail: NTIS HC $6.25 CSCL 06H

A summary of support activities performed to ensure the quality and reliability of the Skylab food system design is reported. The qualification test program was conducted to verify crew compartment compatibility, and to certify compliance of the food system with nutrition, preparation, and container requirements. Preflight storage requirements and handling procedures were also determined. Information on Skylab food items was compiled including matters pertaining to serving size, preparation information, and mineral, calorie, and protein content. Accessory hardware and the engraving of food utensils were also considered, and a stowage and orientation list was constructed which takes into account menu use sequences, menu items, and hardware stowage restrictions. A food inventory system was established and food thermal storage tests were conducted. Problems and comments pertaining to specific food items carried onboard the Skylab Workshop were compiled. A.A.D.

N74-30491*# Orion Research, Inc., Cambridge, Mass.
AUTOMATED POTENTIOMETRIC ELECTROLYTE ANALYSIS SYSTEM Final Report
14 Dec. 1973 185 p
(Contract NAS9-12117)
(NASA-CR-134373; MSC-14627) Avail: NTIS HC $12.25 CSCL 06B

The feasibility is demonstrated of utilizing chemical sensing electrode technology as the basis for an automatically-controlled system for blood gas and electrolyte analyses under weightlessness conditions. The specific measurements required were pH, pCO_2, sodium, chloride, potassium ions, and ionized calcium. The general electrode theory, and ion activity measurements are described along with the fluid transport package, electronics unit, and controller for the automated potentiometric analysis system. Author

N74-30492*# Pillsbury Mills, Inc., Minneapolis, Minn.
SPACE SHUTTLE/FOOD SYSTEM STUDY. VOLUME 2, APPENDIX A: ACTIVE HEATING SYSTEM-SCREENING ANALYSIS. APPENDIX B: RECONSTITUTED FOOD HEATING TECHNIQUES ANALYSIS Final Report
[1974] 170 p
(Contract NAS9-13138)
(NASA-CR-134375) Avail: NTIS HC $11.50 CSCL 06H

Technical data are presented which were used to evaluate active heating methods to be incorporated into the space shuttle food system design, and also to evaluate the relative merits and penalties associated with various approaches to the heating of rehydrated food during space flight. Equipment heating candidates were subject to a preliminary screening performed by a selection rationale process which considered the following parameters: (1) gravitational effect; (2) safety; (3) operability; (4) system compatibility; (5) serviceability; (6) crew acceptability; (7) crew time; (8) development risk; and (9) operating cost. A hot air oven, electrically heated food tray, and microwave oven were selected for further consideration and analysis. Passive, semi-active, and active food preparation approaches were also studied in an effort to determine the optimum method for heating rehydrated food. Potential complexity, cost, vehicle impact penalties, and palatability were considered in the analysis. A summary of the study results is provided along with cost estimates for each of the potential sytems A.A.D.

N74-30493*# Pillsbury Mills, Inc., Minneapolis, Minn.
SPACE SHUTTLE/FOOD SYSTEM. VOLUME 2, APPENDIX C: FOOD COOLING TECHNIQUES ANALYSIS. APPENDIX D: PACKAGE AND STOWAGE: ALTERNATE CONCEPTS ANALYSIS
[1974] 151 p
(Contract NAS9-13138)
(NASA-CR-134376) Avail: NTIS HC $10.75 CSCL 06H

The relative penalties associated with various techniques for providing an onboard cold environment for storage of perishable food items, and for the development of packaging and vehicle stowage parameters were investigated in terms of the overall food system design analysis of space shuttle. The degrees of capability for maintaining both a 40 F to 45 F refrigerated temperature and a 0 F and 20 F frozen environment were assessed for the following cooling techniques: (1) phase change (heat sink) concept; (2) thermoelectric concept; (3) vapor cycle concept; and (4) expendable ammonia concept. The parameters considered in the analysis were weight, volume, and spacecraft power restrictions. Data were also produced for packaging and vehicle stowage parameters which are compatible with vehicle weight and volume specifications. Certain assumptions were made for food packaging sizes based on previously generated space shuttle menus. The results of the study are shown, along with the range of meal choices considered. A.A.D.

N74-30494*# Pillsbury Mills, Inc., Minneapolis, Minn.
SPACE SHUTTLE/FOOD SYSTEM STUDY. VOLUME 2, APPENDIX F: FLIGHT FOOD AND PRIMARY PACKAGING Final Report
[1974] 252 p
(Contract NAS9-13138)
(NASA-CR-134378) Avail: NTIS HC $15.75 CSCL 06H

The analysis and selection of food items and primary packaging, the development of menus, the nutritional analysis of diet, and the analyses of alternate food mixes and contingency foods is reported in terms of the overall food system design for space shuttle flight. Stowage weights and cubic volumes associated with each alternate mix were also evaluated. Author

N74-30495*# Pillsbury Mills, Inc., Minneapolis, Minn.
SPACE SHUTTLE/FOOD SYSTEM STUDY. VOLUME 2, APPENDIX G: GROUND SUPPORT SYSTEM ANALYSIS. APPENDIX H: GALLEY FUNCTIONAL DETAILS ANALYSIS
[1974] 60 p
(Contract NAS9-13138)
(NASA-CR-134379) Avail: NTIS HC $6.00 CSCL 06H

The capabilities for preflight feeding of flight personnel and the supply and control of the space shuttle flight food system were investigated to determine ground support requirements; and the functional details of an onboard food system galley are shown in photographic mockups. The elements which were identified as necessary to the efficient accomplishment of ground support functions include the following: (1) administration; (2) dietetics; (3) analytical laboratories; (4) flight food warehouse; (5) stowage module assembly area; (6) launch site module storage area; (7) alert crew restaurant and disperse crew galleys; (8) ground food warehouse; (9) manufacturing facilities; (10) transport; and (11) computer support. Each element is discussed according to the design criteria of minimum cost, maximum flexibility, reliability, and efficiency consistent with space shuttle requirements. The galley mockup overview illustrates the initial operation configuration, food stowage locations, meal assembly and serving trays, meal preparation configuration, serving, trash management, and the logistics of handling and cleanup equipment. A.A.D.

N74-30496*# Structural Composites Industries, Inc., Azusa, Calif.
IMPROVED FIREMAN'S COMPRESSED AIR BREATHING SYSTEM PRESSURE VESSEL DEVELOPMENT PROGRAM
Harry A. King and Edgar E. Morris Aug. 1973 419 p
(Contract NAS9-12414)
(NASA-CR-134385; SCI-7338) Avail: NTIS HC $24.00 CSCL 06K

Prototype high pressure glass filament-wound, aluminum-lined pressurant vessels suitable for use in a fireman's compressed air breathing system were designed, fabricated, and acceptance tested in order to demonstrate the feasibility of producing such high performance, lightweight units. The 4000 psi tanks have a 60 Standard Cubic Foot (SCF) air capacity, and have a 6.5 inch diamter, 19 inch length, 415 inch volume, weigh 13 pounds when empty, and contain 33 percent more air than the current 45 SCF (2250 psi) steel units. The current steel 60 SCF (3000 psi) tanks weigh approximately twice as much as the prototype when empty, and are 2 inches, or 10 percent shorter. The prototype units also have non-rusting aluminum interiors,

which removes the hazard of corrosion, the need for internal coatings, and the possibility of rust particles clogging the breathing system. AAuthor

N74-30497*# Martin Marietta Corp., Denver, Colo.
FIREFIGHTER'S COMPRESSED AIR BREATHING SYSTEM PRESSURE VESSEL DEVELOPMENT PROGRAM Final Report
E. J. Beck Aug. 1974 211 p refs
(Contract NAS9-12540)
(NASA-CR-134384; MCR-73-214) Avail: NTIS HC $13.75 CSCL 06K

The research to design, fabricate, test, and deliver a pressure vessel for the main component in an improved high-performance firefighter's breathing system is reported. The principal physical and performance characteristics of the vessel which were required are: (1) maximum weight of 9.0 lb; (2) maximum operating pressure of 4500 psig (charge pressure of 4000 psig); (3) minimum contained volume of 280 in. 3; (4) proof pressure of 6750 psig; (5) minimum burst pressure of 9000 psig following operational and service life; and (6) a minimum service life of 15 years. The vessel developed to fulfill the requirements described was completely sucessful, i.e., every category of performence was satisfied. The average weight of the vessel was found to be about 8.3 lb, well below the 9.0 lb specification requirement. Author

N74-30498*# Life Systems, Inc., Cleveland, Ohio.
SIX-MAN, SELF-CONTAINED CARBON DIOXIDE CONCENTRATOR SUBSYSTEM FOR SPACE STATION PROTOTYPE (SSP) APPLICATION Final Report
G. D. Kostell, F. H. Schubert, J. W. Shumar, T. M. Hallick, and F. C. Jensen May 1974 77 p refs
(Contract NAS2-6478)
(NASA-CR-114742; LSI-ER-170-34) Avail: NTIS HC $7.00 CSCL 06K

A six man, self contained, electrochemical carbon dioxide concentrating subsystem for space station prototype use was successfully designed, fabricated, and tested. A test program was successfully completed which covered shakedown testing, design verification testing, and acceptance testing. Author

N74-30499*# Houston Univ., Tex. Dept. of Mechanical Engineering.
CHARACTERIZATION OF HEAT TRANSFER IN NUTRIENT MATERIALS, PART 1 Final Report
J. E. Cox, R. B. Bannerot, C. K. Chen, and L. C. Witte 31 Mar. 1973 47 p refs
(Contract NAS9-11676)
(NASA-CR-134382) Avail: NTIS HC $5.50 CSCL 06H

The principles involved in food heating are discussed. The food heating system for Skylab is described. Thermal models of nutrient materials are analyzed including models in zero-g and low pressure conditions. Results are presented of parametric studies to establish the effect of individual parameters on the thermal response of the system. E.J.O.

N74-30500*# Houston Univ., Tex. Dept. of Mechanical Engineering.
CHARACTERIZATION OF HEAT TRANSFER IN NUTRIENT MATERIALS, PART 2 Final Report
J. E. Cox, R. B. Bannerot, C. K. Chen, and L. C. Witte 31 Dec. 1973 43 p refs
(Contract NAS9-11676)
(NASA-CR-134383; Rept-9-11676-32-Pt-2) Avail: NTIS HC $5.25 CSCL 06H

A thermal model is analyzed that takes into account phase changes in the nutrient material. The behavior of fluids in low gravity environments is discussed along with low gravity heat transfer. Thermal contact resistance in the Skylab food heater is analyzed. The original model is modified to include: equivalent conductance due to radiation, radial equivalent conductance, wall equivalent conductance, and equivalent heat capacity. A constant wall-temperature model is presented. E.J.O.

N74-30501# Naval Aerospace Medical Inst., Pensacola, Fla.
MICROWAVE REFLECTION, DIFFRACTION AND TRANSMISSION STUDIES OF MAN Medical Research Projects Report No. 2
Vernon R. Reno 7 Feb. 1974 46 p refs
(AD-780226; NAMRL-1199) Avail: NTIS CSCL 06/18

A systematic, detailed description of the spatial energy distribution in microwave fields in proximity to man is provided for the first time. Graphic information is provided to demonstrate the effects on the energy distribution of different radiation parameters such as frequency and polarization and of the ratio of subject size to wavelength. The field patterns obtained with man are compared to theoretical studies of simpler objects available in the literature. The information obtained in the present studies is immediately applicable to hazard evaluations and to the design of bioeffect investigations. The most significant benefit of the approach is in the potential for development of a new, noninvasive method for estimating the energy absorbed by man or animals from an incident microwave field. (Modified author abstract) GRA

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-30502* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRODUCTION OF PURE METALS Patent
Warren H. Philipp, Stanley J. Marsik, and Charles E. May, inventors (to NASA) Issued 30 Jul. 1974 4 p Filed 18 Apr. 1972 Supersedes N72-25164 (10 - 16, p 2119) Continuation-in-part of US Patent Appl. SN-876588, filed 13 Nov. 1969
(NASA-Case-LEW-10906-1; US-Patent-3,826,726; US-Patent-Appl-SN-245279; US-Patent-Class-204-157.1H; US-Patent-Appl-SN-876588) Avail: US Patent Office CSCL 07D

A process for depositing elements by irradiating liquids is reported. Ultra pure elements are precipitated from aqueous solutions or suspensions of compounds. A solution of a salt of a metal to be prepared is irradiated, and the insoluble reaction product settles out. Some chemical compounds may also be prepared in this manner.
Official Gazette of the U.S. Patent Office

N74-30503# Technische Universitaet, Munich (West Germany).
CHEMISORPTION OF CARBON MONOXIDE AND CARBON DIOXIDE ON GRAPHITE Ph.D. Thesis [CHEMISORPTION VON CO UND CO2 AN GRAPHIT]
Peter Haslbeck 20 Jul. 1973 84 p refs In GERMAN
Avail: NTIS HC $7.25

Chemisorption of CO on graphite is a typical activation adsorption process at low velocity with a definite isobaric adsorption maximum at about 900 C. Adsorption velocity decreases markedly at 800 C if graphite was in contact with CO2 before tests; this effect is attributed to blocking by oxygen complexes. Transl. By G.G.

N74-30504# Technische Universitaet, Munich (West Germany).
ELECTROCHEMICAL STUDIES ON THE OXYGEN REDUCTION BY HIGHLY POROUS ELECTRODES Ph.D. Thesis [ELEKTROCHEMISCHE UNTERSUCHUNGEN ZUR SAUERSTOFFREDUKTION AN HOCHPOROESEN ELEKTRODEN]
Jozsef Lendvay 23 Jul. 1973 115 p refs In GERMAN
Avail: NTIS HC $8.75

Oxygen reduction in alkaline solutions by porous electrodes is studied on activated nickel sinter electrodes, nickel sinter electrodes containing activated silver, nickel sinter electrodes containing activated mercury, and on porous sintered Teflon electrodes whose one side is covered by a thin catalytic silver layer. Potential volt-ampere characteristic measurements show that a silver-Teflon electrode is performing better than the silver activated sinter electrode and pure silver electrode. Mercury activated electrodes were not satisfactory. Transl. by G.G.

N74-30505# Technische Universitaet, Munich (West Germany).
REVERSIBLE ELECTRODE REACTIONS OF DIFFICULT TO DISSOLVE MATERIALS IN NONAQUATIC ELECTROLYTES

(A CONTRIBUTION TO THE KNOWLEDGE ON POTENTIAL CATHODES FOR SECONDARY HIGH ENERGY DENSITY BATTERIES WITH SPECIAL CONSIDERATION OF GRAPHITE COMPOUNDS) Ph.D. Thesis [REVERSIBLE ELEKTRODENREAKTIONEN SCHWERLOESLICHER STOFFE IN NICHTWAESSRIGEN ELEKTROLYTEN (EIN BEITRAG ZUR KENNTNIS POTENTIELLER KATHODEN FUER SEKUNDAERBATTERIEN HOHER ENERGIEDICHTE UNTER BESONDER BERUECKSICHTIGUNG VON VERBINDUNGEN DES GRAPHITS)]

Juergen Otto Besenhard 17 May 1973 193 p refs In GERMAN

Avail: NTIS HC $12.75

Reversible electrochemical reactions of copper-, silver-, mercury-, and titanium-electrodes in solutions of lithium bromide or lithium iodide in prophylene carbonate were studied by the potentiometric triangular voltage method. Results showed that copper and silver halogens dissolved in excessive LiX quantitatively complex, and that this tendency was minimized for Hg and Pb and not at all pronounced for Ti. Electronically conductive active graphite oxidized was reversible in numerous nonaquaous solutions. A graphite anodic reaction was proven in organic electrolytic solutions of MX/PC (MX = LiClO4, NaBF4, KPF6) by the oxidation of stoichoimetric graphite compounds C sub n X with n greater than or equal to 24. Transl. by G.G.

N74-30506# Technische Universitaet, Munich (West Germany).

STUDIES ON THE PHOTOELECTROCHEMICAL BEHAVIOR OF METAL ELECTRODES Ph.D. Thesis [UNTERSUCHUNGEN ZUM PHOTOELEKTROCHEMISCHEN VERHALTEN VON METALLELEKTRODEN]

Eckart Meyer 2 Aug. 1973 147 p refs In GERMAN

Avail: NTIS HC $10.50

It is experimentally proven that anodic as well as cathodic photoactivity of free surface electrons is caused by the metal excitation mechanisms that can produce energies substantially above or below the Fermi energy. Measurable photon flux is mostly determined by reaction mechanisms following cathodic or anodic polarization at the electrodes. Potential threshold energy in anodic photon fluxes depends on the emission energies of the excited electrons. Transl. by G.G.

N74-30507# National Bureau of Standards, Boulder, Colo. Inst. for Basic Standards.

LIQUID-VAPOR EQUILIBRIA IN THE NITROGEN-METHANE SYSTEM BETWEEN 95 AND 120 K

W. R. Parrish and M. J. Hiza 10 Aug. 1973 22 p refs Presented at the 1973 Cryogenic Eng. Conf., Atlanta, 8-10 Aug. 1973

(Paper-K9) Avail: NTIS HC $4.25

A study was undertaken to obtain liquid-vapor equilibria data for the nitrogen-methane system at uniform temperature increments between the triple point of methane and the critical point of nitrogen. The measured liquid and vapor phase equilibria compositions and the derived excess Gibbs energy values for six isotherms from 95 to 120 K are compared with the corresponding values taken from other investigations. The excess Gibbs energy for the equimolar mixture exhibits a zero to slightly positive temperature dependence, in qualitative agreement with calculations based on the Snider-Herrington hard sphere model. This temperature dependence of the excess Gibbs energy also suggests that the excess enthalpy (heat of mixing) must be equal to or slightly less than the excess Gibbs energy. Author

N74-30508*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.

KINETICS OF HOMOGENEOUS NUCLEATION IN MANY COMPONENT SYSTEMS

Joseph O. Hirschfelder 5 Apr. 1974 23 p refs Sponsored by NASA Prepared in cooperation with Calif. Univ., Santa Barbara

(NASA-CR-139529; WIS-TCI-510) Avail: NTIS HC $4.25 CSCL 07D

Reiss's classical treatment of the kinetics of homogeneous nucleation in a system containing two chemical components is extended to many-component systems. The formulation is analogous to the pseudo-stationary state theory of chemical reaction rates with the free energy as a function of the composition of the embryo taking the place of the potential energy as a function of interatomic distances. Author

N74-30509# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.

EVALUATION OF A NOVEL ELECTROPHORETIC SEPARATION METHOD TO REMOVE PYRITIC SULFUR FROM COAL

K. J. Miller and A. F. Baker 1974 17 p ref Sponsored by EPA

(BM-RI-7960) Avail: NTIS HC $4.00

Electrophoretic mobility measurements of coal and pyrite particles in distilled water revealed a difference between the migration speeds of the two materials toward the anode in a dc electric field. This information led to the development of a laboratory electrophoresis column for separating fine pyrite from coal by utilizing the electrokinetic and the specific gravity differences between coal and pyrite. The study demonstrated on a laboratory scale that pyrite and other impurities can be separated from fine coal by electrophoresis using a stage separation technique. Author

N74-30510# State Univ. of New York, Buffalo. Dept. of Chemistry.

EFFECT OF CHANGING ALLOY COMPOSITION ON HYDROGENATION REACTIONS Final Report

D. A. Cadenhead Dec. 1973 11 p refs

(Contract AT(11-1)-3706)

(TID-26525) Avail: NTIS HC $3.00

Studies of chemical reactivity and surface composition have been carried out on a series of reduced oxide copper nickel alloys. The results show that the chemical reactivity of these alloys, while dependent on the exact nature of the process, has little or no correlation with the bulk composition. Reactivity is, however, clearly a function of the surface composition which was determined through hydrogen chemisorption titrations. The surface composition approximated closely to that predicted from thermodynamic considerations, remaining constant over a wide bulk compositional range. The situation is not unlike that found for copper nickel evaporated metal films; however precise observations on the granular material can be complicated by both surface impurities and porosity. The possibility of controlling surface composition, and hence reactivity, of reduced oxide alloy catalysis (either supported or non-supported) has been demonstrated. Author (NSA)

N74-30511# Technische Universitaet, Hanover (West Germany). Inst. fuer Technische Chemie.

NEW METHOD FOR THE INVESTIGATION OF MASS TRANSFER THROUGH THE INTERFACE BETWEEN TWO DIFFERENT LIQUID PHASES

H. G. Blaschke Dec. 1973 85 p refs In GERMAN

(BMFT-FBK-73-28) Avail: AEC Depository Libraries HC $6.25

A new method was developed which permits the simultaneous measurement of the interfacial concentration and the bulk phase concentration of a transferred solute. The principle was developed from the well known liquid scintillation counting technique and uses the short range of weak beta-emitters. This is the first time that the measurement of the interfacial concentration in the range of microns has been made possible under mass transfer conditions. In the system toluene-water-pyridine, equilibrium conditions are not fulfilled. The result proves the existence of a mass transfer resistance which may be caused by hydrogen bonds between water and pyridine. NSA

N74-30512# Oak Ridge National Lab., Tenn.

NSF-RANN TRACE CONTAMINANTS ABSTRACTS

Emily D. Copenhaver, ed. Feb. 1974 34 p refs Sponsored in part by NSF

(Contract W-7405-eng-26)

(ORNL-EIS-73-60-Vol-1-No-4) Avail: NTIS HC $3.75

Thirty-one abstracts of publications on the contamination of the environment by various chemical pollutants and trace metals are included. (NSA)

N74-30513# Argonne National Lab., Ill. Chemical Engineering Div.

PHYSICAL INORGANIC CHEMISTRY Semiannual Report, Jan. - Jun. 1973
M. Blander, P. T. Cunningham, H. M. Feder, V. A. Maroni, H. C. Schnyders, E. Veleckis, R. C. Vogel, and L. Burris Oct. 1973 64 p refs
(Contract W-31-109-eng-38)
(ANL-8023) Avail: NTIS HC $4.00

Tensimetric and gravimetric measurements of the thermodynamic properties of the Li-H2 systems were made and Sieverts' law of constants for H2 in molten lithium and free energies of formation of LiH were derived from the data. An experimental investigation of the Li-N2 system was initiated. Scoping studies for the handling and recovery of tritium in fusion reactor reference models were made to better define potential problems. The limit of superheat for propane was measured and a theoretical calculation of the thermodynamic limit of superheat is given. Conditions for the attainment of the limit of superheat are discussed to define conditions where contact vapor explosions may occur. Raman spectra of LiCl3-KCl melts confirm the presence of a symmetric complex ion. The Conformal Ionic Solution (CIS) theory was utilized to calculate liquids temperatures in the Na, Ti-NO3, Cl3 and the Li, K-NO3, Cl systems, which are in good agreement with measurements. A limitation of the CIS theory for calculating miscibility gaps is discussed. Calculations of physical properties using nonempirical pair potentials for helium are in excellent agreement with measurements. A detailed study of calcium-aluminum rich inclusions in the Allemde meteorite indicate that they were liquid. This places important constraints on their origin. The chemistry of atmospheric particulates was studied as a function of size and time. NSA

N74-30514# National Academy of Sciences - National Research Council, Washington, D.C.
FIRE HAZARD CLASSIFICATION OF CHEMICAL VAPORS RELATIVE TO EXPLOSION PROOF ELECTRICAL EQUIPMENT Interim Report
H. Carhart and R. B. Beckmann May 1973 44 p
(Contracts DOT-OS-00035; DOT-CG-11775-A)
(AD-779179; USCG-D-92-74) Avail: NTIS CSCL 07/3

A detailed study of flammability has been made by the Electrical Hazards Panel of the Committee on Hazardous Materials in order to assign tentative classification to 370 chemicals of commerce according to the classification Groups given in the National Electrical Code, NEC 500. The method used was based on available physical and flammability properties, and chemical structure as an adjunct (by homology and analogy where data were limited. A brief discussion of electrical equipment fire protection is included. This is a supplementary report to Report II, October 7, 1971, and includes the classification of about 170 additional materials. (Modified author abstract) GRA

N74-30515# Northwestern Univ., Evanston, Ill.
SULFUR IN THE CORROSION OF SUPERALLOYS Final Report, 16 Aug. 1972 - 31 Oct. 1973
J. Bruce Wagner, Jr. Mar. 1974 9 p refs
(Grant DA-ARO(D)-31-124-73-G8)
(AD-779542; AROD-8886-5-MC) Avail: NTIS CSCL 11/6

The diffusion of sulfur in single and polycrystalline oxides of Ni, Co, Al, Cr and Fe has been studied. Sulfur diffuses more rapidly than the host anion and less rapidly than the host cation for the oxides studied. Porosities and grain boundaries increase the migration rate. In the case of nickel oxide it has been inferred that sulfur diffuses by anion vacancies. GRA

N74-30516# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
ELLIPSOMETRY TECHNIQUES AND THEIR APPLICATION TO OXIDE FILM GROWTH ON ALUMINUM Technical Report, Nov. 1972 - Jun. 1973
Neil T. McDvitt Jan. 1974 39 p refs
(AF Proj. 7340)
(AD-779717; AFML-TR-73-245) Avail: NTIS CSCL 07/4

The results of ellipsometric measurements on 2024-T-3 clad aluminum surfaces subjected to various etching treatments are presented. Measurements on the bare aluminum substrate indicate the complex refractive index is 1.14 (1-i4.06). Oxide film growth on the substrate shows the ellipsometric parameter delta decreases linearly as the film grows to 300A. It is observed that the variation of the ellipsometric parameter psi with small changes in the absorption coefficient of the film is much larger than the variation in delta. The general results of this study reveal that in most cases an average oxide film thickness can be determined, but surface inhomogeneity due to the etching solution can lead to incorrect interpretation of oxide film thickness if ground rules for matching observed to calculated data are not established. Author (GRA)

N74-30517# Wayne State Univ., Detroit, Mich. Dept. of Physics.
MAGNETIC ORDER IN ALKALIBORATE AND ALUMINOSILICATE GLASSES CONTAINING LARGE CONCENTRATIONS OF IRON-GROUP IONS
H. O. Hooper, G. B. Beard, R. M. Catchings, R. R. Bukrey, M. Forrest, P. F. Kenealy, R. W. Kline, T. J. Moran, Jr., J. G. OKeefe, R. L. Thomas et al 1973 19 p refs Repr. from Amorphous Magnetism, 1973 p 47-63
(Grant AF-AFOSR-2002-71)
(AD-765281/1; AFOSR-73-1338TR) Avail: NTIS CSCL 07/4

A brief review of studies of magnetic interactions and atomic structure is reported for borate and silicate base inorganic glasses containing large amounts of iron group ions. Several experimental techniques have been employed to study the atomic structure and magnetic properties of alkaliborate glasses containing large amounts of iron and aluminosilicate glasses containing large percentages of cobalt and manganese ions. This work includes extensive Mossbauer studies, low field magnetic susceptibility measurements, X-ray diffraction studies, magnetic resonance measurements and ultrasonic sound velocity measurements. Various magnetic behaviors are exhibited by these glasses, depending on glass composition and the glass preparation procedure. GRA

N74-30518# Illinois State Water Survey, Urbana.
TRACE ELEMENT CHEMISTRY STUDIES Technical Report, 1972 - 1973
Donald F. Gatz 30 Jun. 1973 14 p
(Contract DI-14-06-D-7197)
(PB-228821/5; ISWS-73-CON-144; TR-7) Avail: NTIS HC $4.00

This work was undertaken to measure background silver in Illinois precipitation in the absence of any known seeding operation in or near Illinois. GRA

N74-30519# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
COMPARATIVE INVESTIGATIONS OF THE SCATTERED LIGHT COUNTING METHOD FOR THE REGISTRATION OF CAVITATION NUCLEI AND THE COULTER COUNTER
A. Keller, E. Yilmaz, and F. G. Hammitt Jan. 1974 65 p refs
(Grant NSF G-01357)
(PB-228128/5; UMICH-01357-36-T) Avail: NTIS HC $6.25 CSCL 07D

Two measuring procedures for evaluating the cavitation nucleus distribution in water, the scattered light method and the Coulter counter, are directly compared by testing equal water samples with both methods. To clarify whether these techniques can give satisfactory information on the nucleus spectrum, although they cannot distinguish between particles and bubbles, a series of tests were carried through with different water samples of known qualities concerning the nucleus content. The results indicate that the optical method is feasible for measuring the nucleus spectrum of any water sample. The applicability of the Coulter counter for recording the nucleus spectrum of water is limited. Author (GRA)

N74-30520# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
COMPARATIVE MEASUREMENTS BY SCATTERED LIGHT AND COULTER COUNTER METHOD FOR CAVITATION NUCLEI SPECTRA
A. P. Keller, F. G. Hammitt, and E. Yilmaz Jan. 1974 15 p refs
(PB-228123/6; UMICH-01357-23-I) Avail: NTIS HC $4.00 CSCL 07D

Two procedures for measuring cavitation nuclei spectra in tap water have been investigated in detail, i.e., laser light scattering

technique and a Coulter counter. It has been found that nuclei counts from the Coulter counter are far below the correct result unless the water conductivity is raised to a value well above that of most of the particles. The optical method is feasible for in situ measurements for any water, rapidly flowing or nearly static. The measured spectra are approximately the same as those which would be obtained if all the particles were spherical bubbles. The Coulter counter requires sampling and the addition of a small quantity of an electrolyte to ordinary tap water to obtain best results. Author (GRA)

N74-30521# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
THERMODYNAMIC PROPERTIES OF HIGH TEMPERATURE MATERIALS Final Report
Norman D. Potter and Gerry Piper 31 Mar. 1974 32 p refs
(Contract F44620-72-C-0082; AF Proj. 9750)
(AD-780111; U-6068; AFOSR-74-0799TR) Avail: NTIS CSCL 07/4

A careful equilibrium study of the Si-N vapor system of mass spectrometry has shown that the only important binary Si-N vapor species is the previously known Si2N. Its heat of formation is 83 plus or minus 4 Kcal/mole. No ternary Si-N-O nor Si-C-N species were found. The accepted heats of formation of Si2C(g) and SiC2(g) were confirmed as was the heat of formation of Si3(g). The vaporization behavior of Si3N4(c) was studied and found to be quite complex. From a study of the vaporization of VF3 it was found that the primary vapor species at VF3(g) with minor, and approximately equal partial pressures of VF2(g) and VF4(g). Due to sample impurity little could be inferred from the vaporization of VF4. From these experiments and estimates of the auxiliary heats and thermal function, heats of formation were estimated. (Modified author abstract) GRA

N74-30522# Geological Survey, Reston, Va.
PHAS 20: A PROGRAM FOR SIMULTANEOUS MULTIPLE REGRESSION OF A MATHEMATICAL MODEL TO THERMOCHEMICAL DATA
John L. Haas, Jr. Jun. 1974 164 p refs
(Contract DI-14-30-3040)
(AD-780301; USGS-GD-74-018) Avail: NTIS CSCL 07/4

PHAS 20 performs simultaneous multiple regression of a mathematical model for the functional relations among thermodynamic quantities to experimental data for a group of chemically related species. The thermodynamic quantities included are heat capacity, entropy, enthalpy, free energy, equilibrium constant, electrochemical potential, and relative heat content. PHAS 20 will fit the model to 70 sets of data containing a total of 1200 observations on 20 species. The program is divided into 4 major parts: (1) data input and editing, (2) multiple regression, (3) output of error plots and associated tubular data, and (4) output of tables of preliminary thermodynamic values. Listings are included. GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-30523* National Aeronautics and Space Administration. Pasadena Office, Calif.
COHERENT RECEIVER EMPLOYING NONLINEAR COHERENCE DETECTION FOR CARRIER TRACKING Patent
William C. Lindsey and Marvin K. Simon, inventors (to NASA) Issued 6 Aug. 1974 12 p Filed 10 May 1973 Supersedes N73-23118 (11 - 14, p 1620) Sponsored by NASA
(NASA-Case-NPO-11921-1; US-Patent-3,828,138;
US-Patent-Appl-SN-359039; US-Patent-Class-179-15BC;
US-Patent-Class-325-346) Avail: US Patent Office CSCL 17B

The concept of nonlinear coherence employed in carrier tracking to improve telecommunications efficiency is disclosed. A generic tracking loop for a coherent receiver is shown having seven principle feedback signals which may be selectively added and applied to a voltage controlled oscillator to produce a reference signal that is phase coherent with a received carrier. An eighth feedback signal whose nonrandom components are coherent with the phase detected and filtered carrier may also be added to exploit the sideband power of the received signal. A ninth feedback signal whose nonrandom components are also coherent with the quadrature phase detected and filtered carrier could be additionally or alternatively included in the composite feedback signal to the voltage controlled oscillator.
Official Gazette of the U.S. Patent Office

N74-30524* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DIGITAL COMMUNICATION SYSTEM Patent
Leo G. Monford, Jr., inventor (to NASA) Issued 6 Aug. 1974 10 p Filed 28 Nov. 1972 Supersedes N73-12151 (11 - 03, p 0266)
(NASA-Case-MSC-13912-1; US-Patent-3,828,137;
US-Patent-Appl-SN-310034; US-Patent-Class-179-15AT;
US-Patent-Class-179-15BY) Avail: US Patent Office CSCL 17B

A digital communication system is reported for parallel operation of 16 or more transceiver units with the use of only four interconnecting wires. A remote synchronization circuit produces unit address control words sequentially in data frames of 16 words. Means are provided in each transceiver unit to decode calling signals and to transmit calling and data signals. The transceivers communicate with each other over one data line. The synchronization unit communicates the address control information to the transceiver units over an address line and further provides the timing information over a clock line. A reference voltage level or ground line completes the interconnecting four wire hookup. Official Gazette of the U.S. Patent Office

N74-30525 British Library Lending Div., Boston Spa (England).
MODULATION DISTORTION IN fm-fdm RADIO RELAY SYSTEMS CAUSED BY FADING
L. Fehlhaber [1973] 17 p refs Transl. into ENGLISH from Nachrichtentech. Z. (West Germany), v. 26, no. 2, 1973 p 70-75
(BLL-Trans-3050-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Fading in radio relay systems is dicussed along with the particular kinds of modulation distortion expected in FM radio links. E.J.O.

N74-30526 California Univ., Los Angeles.
PACKET SWITCHING IN A MULTI-ACCESS BROADCAST CHANNEL WITH APPLICATION TO SATELLITE COMMUNICATION IN A COMPUTER NETWORK Ph.D. Thesis
Simon Sin-sing Lam 1974 306 p
Avail: Univ. Microfilms Order No. 74-18779

The objective is to develop analytic models for the evaluation and optimization of the system performance in terms of stability, throughput, and delay. Advantages of packet switched satellite and ground radio systems over conventional wire communications for large computer-communication networks are discussed. The emphasis is on a high-speed channel shared by a large population of small users. The channel behavior is typical of contention systems in which the throughput vanishes to zero as the load on the system increases. This phenomenon is called channel saturation. The channel may go into saturation as a result of (1) time fluctuations, and (2) stochastic fluctuations in the channel input. The channel response to time varying inputs is studied using a deterministic approximation analysis. Dissert. Abstr.

N74-30527 Stanford Univ., Calif.
LATITUDE AND SOLAR-CYCLE DEPENDENCE OF THE HEIGHT OF 9.1 cm SOLAR RADIO EMISSION Ph.D. Thesis
Werner Graf 1974 68 p
Avail: Univ. Microfilms Order No. 74-13631

Some aspects of the 9.1 cm radio emission using the Stanford maps are reported. The period of interest is the active part of the solar cycle which lasted from about 1968-71. Active regions on the sun that are sources of microwave emission should appear displaced in latitude relative to the associated optical feature

and from this displacement it should be possible to deduce the height above the photosphere were the emission originates. The displacement is only about one-third of a minute of arc, nevertheless it was found possible, in an investigation based on 1264 cases in 1970, to obtain a height with a precision as good as or better than has generally been achieved in previous studies based on the rate of motion in longitude. This success could be due to the possibility of using large quantities of data or to tolerance of the method to both terrestrial atmospheric refraction and proper motion in heliographic longitude.
Dissert. Abstr.

N74-30528 California Univ., Los Angeles.
EXTREMELY LOW FREQUENCY HISS EMISSIONS IN THE MAGNETOSPHERE Ph.D. Thesis
King-Wang Chan 1974 210 p
Avail: Univ. Microfilms Order No. 74-18760

The extremely low frequency hiss emissions in the magnetosphere were studied, using the data from the UCLA/JPL triaxial search coil magnetometer experiment on OGO-5 and OGO-6. In supplement ot the wave observations, simultaneous measurements of ion density, ambient magnetic field, and energetic electron flux from the complementary experiments on OGO-5 were analyzed. In regions of the detached ion density enhancements outside the plasmasphere, a narrow band of hiss emission (Dp hiss) between 50 and 200 Hz was detected consistently. This is of distinctly lower frequency than the hiss between 200 and 500 Hz observed inside the plasmasphere. The occurrence patterns, spectral characteristics, wave polarization, and normal vector direction of the DP hiss are presented for the first time.
Dissert. Abstr.

N74-30529 British Library Lending Div., Boston Spa (England).
PROBABILITY DISTRIBUTIONS RELATING TO SYNCHRONISATION TIME FOR BLOCK SYNCHRONISATION IN TIME DIVISION MULTIPLEX SYSTEMS
U. Isphording 1973 20 p refs Transl. into ENGLISH from Arch. Elek. Uebertrag. (West Germany), v. 27, no. 6, 1973 p 253-257
(BLL-Trans-3043-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

In binary data transmission, particularly in PCM systems, the concept of block synchronization is used. Apart from the message bits, the transmitter sends additional information to the receiver which signifies block start at fixed intervals. The probability distribution of the number of pseudo-words likely to be met by the receiver before reaching a genuine sync word is calculated. It is assumed that the message bits are independent of each other and are uniformly distributed. J.A.M.

N74-30530 British Library Lending Div., Boston Spa (England).
SYNCHRONISING INTEGRATED PCM NETS BY DIGITALLY CONTROLLED PHASE AVERAGING
H. L. Hartmann 10 Dec. 1973 18 p refs Transl. into ENGLISH from Nachrichtentech. Z. (West Germany), v. 21, no. 9, 1968 p 533-539
(BLL-Trans-2914-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The essential control provisions of integrated PCM nets are discussed, using a telephone network model as an example. The conditions for the existence of hunting and stable operation are found experimentally and mathematically. Author

N74-30531# RAND Corp., Santa Monica, Calif.
COMMUNICATIONS TECHNOLOGY AND THE CONGRESS
Walter S. Baer Apr. 1974 10 p ref Presented at the Joint Comm. on Congressional Operations, Congr. of the United States, 10 Apr. 1974
(P-5215) Avail: NTIS HC $4.00

Communication technology is making more channels of visual and audio information available to more people at lower cost. This increased capacity will particularly benefit the Congress by providing access for a diversity of ideas and opinions, but Congress need not wait for the advent of the wired nation or the information utility to use mass communications more effectively. Creating a television service to provide coverage of Congressional proceedings for radio, broadcast television, and existing cables systems is an important step toward better communication with the American people. Author

N74-30532*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPARATUS FOR SIMULATING OPTICAL TRANSMISSION LINKS Patent Application
M. W. Fitzmaurice and Mona Tycz, inventors (to NASA) Filed 25 Jun. 1974 20 p
(NASA-Case-GSC-11877-1; US-Patent-Appl-SN-482953) Avail: NTIS HC $4.00 CSCL 17B

A space-to-space or space-to-earth optical transmission link is simulated by positioning a linear optical modulator between an optical carrier source and a receiver for the carrier. The optical modulator is driven by an analog signal having random variations indicative of characteristics of the transmission link, as derived from an analog computer circuit. The analog computer circuit is responsive to a Gaussian random analog source. For certain types of links, the analog computer circuit is responsive to a pair of Gaussian analog signals which are derived by feeding a relatively wide band Gaussian analog source in parallel to a first low pass filter and to a heterodyne circuit. For space-to-space transmission, transmitter pointing jitter is a dominant noise source and is simulated by deriving a beta statistical variation from the analog computer. NASA

N74-30533*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN APPLICATION OF QUEUEING THEORY TO THE DESIGN OF CHANNEL REQUIREMENTS FOR SPECIAL PURPOSE COMMUNICATIONS SATELLITES Ph.D. Thesis
Gerald Fredrick Hein Aug. 1974 111 p refs
(NASA-TM-X-71590) Avail: NTIS HC $4.50 CSCL 17B

Special purpose satellites are very cost sensitive to the number of broadcast channels, usually will have Poisson arrivals, fairly low utilization (less than 35%), and a very high availability requirement. To solve the problem of determining the effects of limiting C the number of channels, the Poisson arrival, infinite server queueing model will be modified to describe the many server case. The model is predicated on the reproductive property of the Poisson distribution. Author

N74-30534*# Alabama A & M Univ., Huntsville. School of Technology.
ANALYSIS OF THE PROPOSED UTILIZATION OF TDRS SYSTEM BY THE HEAO-C SATELLITE Final Report
Glenn Weathers 29 May 1974 165 p
(Grant NGR-01-001-021)
(NASA-CR-139393) Avail: NTIS HC $11.25 CSCL 17B

The primary function of the study was to assess the impact upon the HEAO telecommunications system of the proposed relay satellite-to-ground-link configuration. The system is designed to perform the function of most of the NASA ground tracking and communications network at a net cost savings for NASA. Author

N74-30535# Joint Publications Research Service, Arlington, Va.
MEASURING TECHNIQUE AND EQUIPMENT FOR STUDYING BACKSCATTERING OF ULTRASONIC WAVES BY BIOLOGICAL OBJECTS IN WATER
V. G. Samovolkin 31 Jul. 1974 10 p refs Transl. into ENGLISH from Okeanologiya (Moscow), v. 14, no. 1, 1974 p 187-191
(JPRS-62606) Avail: NTIS HC $4.00

The measurement method made it possible to do away with calibrated targets. Theoretical and experiment frequency functions of the backscattering of a steel sphere are compared. A procedure is described for measuring scattering characteristics of objects and polar backscattering characteristics which are nonuniform. Author

N74-30536*# Wisconsin Univ., Madison. Space Science and Engineering Center.
VENUS WIND-ALTITUDE RADAR Final Report, 16 Jan. - 30 Jun. 1974
Nadav Levanon Jun. 1974 26 p
(Contract NAS2-8015)

(NASA-CR-137549) Avail: NTIS HC $4.50 CSCL 17I

A design study on adding radar altimeter to the Pioneer Venus small probe is review. Block and timing diagrams are provided. The inherent and interface ambiguities, resolution, and data handling logic for radar altimeters are described. J.A.M.

N74-30537# Sandia Corp., Albuquerque, N.Mex.
GROUND-ECHO CHARACTERISTICS FOR A GROUND-TARGET PULSE-DOPPLER RADAR FUZE OF HIGH DUTY RATIO

C. S. Williams 21 Nov. 1973 17 p refs Presented at the Tri-Serv. Electron. Fuse Symp., Washington, D. C. Sponsored by AEC

(SLA-73-5997; Conf-731131-1) Avail: NTIS HC $3.00

A pulse Doppler radar fuze for use against ground targets at high burst heights can operate at low peak power provided a high duty ratio is used. The high duty ratio brings about ambiguous ground return that is prevented from firing the fuze by randomly coding the phase of the transmitted pulses. This causes the ambiguous return to appear as random noise. This paper provides formulas for the calculation of the clutter noise power density and of the signal power so that the performance of the radar can be determined. The paper also discusses the myth of decorrelation that is alleged to destroy the transmitted phase modulation in the echo and so make it useless.

Author (NSA)

N74-30538# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MILLSTONE HILL RADAR PROPAGATION STUDY: SCIENTIFIC RESULTS, PART 3

John V. Evans 13 Nov. 1973 73 p refs Prepared in cooperation with Bell Telephone Labs., Murray Hill, N.J.

(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-614)

(AD-780519; ESD-TR-73-261-Pt-3) Avail: NTIS CSCL 04/1

Contents: High-latitude ionospheric disturbances; Auroral returns; Models for transient phenomena. GRA

N74-30539# Technology Service Corp., Santa Monica, Calif.
REVISION TO THE FREQUENCY TRACKING AND ESTIMATION PROGRAM (PHASE-LOCKED LOOP)

Roger M. Golden and William B. Kendall Feb. 1974 56 p refs

(Contract N00014-71-C-0033)

(AD-780461; TSC-PD-067-21) Avail: NTIS CSCL 17/2

A number of modifications have been incorporated into the Frequency Tracking and Estimation Program (Phase-Locked Loop). The modifications improve the tracking properties of the PLL as well as make the program more convenient to use. A summary of the modifications along with a description of all of the parameters needed by the program is given in this report.

Author (GRA)

N74-30540# Lincoln Lab., Mass. Inst. of Tech., Lexington.
UHF FADING FROM A SYNCHRONOUS SATELLITE OBSERVED AT KWAJALEIN, OCTOBER 1970 THROUGH JUNE 1972

Burt E. Nichols 22 Mar. 1974 29 p refs

(Contract F19628-73-C-0002; AF Proj. 649L)

(AD-780174; TN-1974-19; ESD-TR-74-139) Avail: NTIS CSCL 17/2

A receiving system was installed on Kwajalein for the purpose of continuously recording the received signal level from the TACSAT beacon at 254.1 MHz in order to help determine the statistics of amplitude fading or scintillation from UHF satellites at near-equatorial latitudes. This note summarizes data recorded from October 28, 1970 through June 20, 1972. Significant periods of fading were observed. Essentially all of the fading occurred between 8:00 pm and 6:00 am local time. Very little fading (less than 4% of the time) occurred during the winter (November to March) and significant fading (over 10% of the time) occurred during the spring and summer (April to August). Fading usually was as much as 10 db and 20 db below the average level with accompanying enhancements up to 6 db. Fading rates usually were in the range of 1 to 3 seconds with occasional longer periods up to 10 seconds. Author (GRA)

N74-30541# Ohio State Univ., Columbus. ElectroScience Lab.

A NEW METHOD FOR COMBINING THE METHOD OF MOMENTS WITH THE GEOMETRICAL THEORY OF DIFFRACTION

T. H. Newhouse and G. A. Thiele Mar. 1974 59 p refs

(Contract N00014-67-A-0232-0018)

(AD-780055; ESL-3468-4) Avail: NTIS CSCL 20/14

A technique for combining moment methods with the geometrical theory of diffraction is presented which permits the solution of problems which cannot be practically solved by either method individually. The fundamental idea used to develop the hybrid technique is to modify the usual impedance matrix which characterizes, for example, a wire antenna such that a nearby metallic body or discontinuity on that body is properly accounted for. This modification is readily accomplished using the geometrical theory of diffraction and/or geometrical optics. Several example problems are considered to illustrate the usefulness of the technique. (Modified author abstract) GRA

N74-31056 Joint Publications Research Service, Arlington, Va.
BEARING CHARACTERISTICS FOR SOME STATISTICAL MODELS OF SPATIALLY DISTRIBUTED SIGNAL SOURCES

V. I. Vorobyev and V. G. Solonenko *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 83-86 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 85-88 (For availability see N74-31043 20-19)

N74-31063 Joint Publications Research Service, Arlington, Va.
CERTAIN PROBLEMS OF THE REPRESENTATION OF SCATTERED SIGNALS FOR THE PURPOSE OF ANALOGUE MODELING

N. S. Gubonin *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 111-114 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 115-118 (For availability see N74-31043 20-19)

N74-31169 Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF SIGNALS PROPAGATED IN A WATER MEDIUM ON THE BASIS OF PROCESSING THEM BY STRUCTURAL PROPERTIES

A. M. Zayezdnyy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 14-24 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 14-22 (For availability see N74-31167 20-23)

N74-31172 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE UNPREDICTABLE COMPONENT OF ABSORPTION OF AN AQUEOUS MEDIUM ON THE MUTUAL CORRELATION OF THE REFERENCE AND USABLE SIGNALS

V. V. Olshevskiy and V. F. Pelevin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 40-51 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 36-46 (For availability see N74-31167 20-23)

N74-31179 Joint Publications Research Service, Arlington, Va.
ENERGY CHARACTERISTICS OF FAR REVERBERATION

K. B. Vakar, Ye. V. Kirillov, and N. I. Ovchinnikov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 111-115 Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 105-109 (For availability see N74-31167 20-23)

N74-31180 Joint Publications Research Service, Arlington, Va.
MEASURING THE GLANCING ANGLES OF COMPONENTS OF A MULTIBEAM SIGNAL

V. A. Kakalov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 116-125 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike"

Novosibirsk, 1973 p 110-121 (For availability see N74-31167 20-23)

N74-31182 Joint Publications Research Service, Arlington, Va.
PROBLEM OF OPTIMIZING SIGNALS IN CORRELATORS FOR COMMUNCATIONS VIA A HYDROACOUSTIC CHANNEL WITH PARAMETERS WHICH VARY IN TIME
S. D. Chuprov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 133-141 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 130-138 (For availability see N74-31167 20-23)

N74-31183 Joint Publications Research Service, Arlington, Va.
PROPAGATION OF A MODULATED NOISE SIGNAL IN A MULTIBEAM CHANNEL WITH CONSTANT PARAMETERS
E. P. Gulin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 142-151 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 139-147 (For availability see N74-31167 20-23)

N74-31184 Joint Publications Research Service, Arlington, Va.
SOME LOCAL SCATTERING CHARACTERISTICS OF ULTRASOUND BY THE SURFACE AERATED LAYER OF THE SEA DURING VERTICAL SOUNDING
A. P. Aleksandrov and E. S. Vayndruk *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 152-160 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 148-157 (For availability see N74-31167 20-23)

N74-31185 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF SURFACE REVERBERATION DURING LOCAL IRRADIATION OF SEAWATER
E. S. Vayndruk and A. S. Paritskiy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 161-171 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 158-167 (For availability see N74-31167 20-23)

N74-31187 Joint Publications Research Service, Arlington, Va.
DETECTION OF NOISE SIGNALS IN A FIELD OF DISTRIBUTED AND LOCAL INTERFERENCE
N. G. Gatkin, V. S. Gorbenko, S. N. Zaliznyak, and D. G. Krasnyy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 195-203 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 201-212 (For availability see N74-31167 20-23)

N74-31188 Joint Publications Research Service, Arlington, Va.
INDETERMINACY FUNCTION FOR OPTIMAL SPACE-TIME PROCESSING OF SIGNALS
Yu. D. Bozhok, N. G. Gatkin, M. I. Karnovskiy, L. G. Krasnyy, and S. V. Pasechnyy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 204-209 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 213-220 (For availability see N74-31167 20-23)

N74-31189 Joint Publications Research Service, Arlington, Va.
NOISEPROOFNESS OF OPTIMAL RECEIVERS FOR THE TWO-COMPONENT SIGNAL
N. G. Gatkin and V. M. Pyanov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 210-216 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 221-228 (For availability see N74-31167 20-23)

N74-31190 Joint Publications Research Service, Arlington, Va.
DETECTION CHARACTERISTICS OF THE STANDARD CHANNEL WHEN RECEIVING A TWO-COMPONENT SIGNAL
V. M. Pyanov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 217-222 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 228-234 (For availability see N74-31167 20-23)

N74-31191 Joint Publications Research Service, Arlington, Va.
SIGNAL DETECTION IN THE PRESENCE OF NONGAUSSIAN NOISE
N. G. Gatkin and V. L. Kramarenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 223-228 refs Transl. into ENGLISH of the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 235-240 (For availability see N74-31167 20-23)

N74-31192 Joint Publications Research Service, Arlington, Va.
PROBLEM OF CALCULATING THE CORRELATION FUNCTIONS OF ECHOES FROM A CIRCULAR CYLINDER OF FINITE ALTITUDE
L. Ya. Taradanov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 229-231 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 241-243 (For availability see N74-31167 20-23)

N74-31193 Joint Publications Research Service, Arlington, Va.
ACCUMULATION OF FLUCTUATING PULSE SIGNALS WITH DIFFERENT PROBABILITY DISTRIBUTIONS
V. V. Olshevskiy and S. L. Pivovarov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 232-237 Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 244-250 (For availability see N74-31167 20-23)

N74-31196 Joint Publications Research Service, Arlington, Va.
COMPARATIVE ANALYSIS OF THE NOISEPROOFNESS OF CERTAIN TYPES OF MANIPULATION WHEN TRANSMITTING TELEMETRIC INFORMATION OVER A HYDROACOUSTIC CHANNEL
S. P. Rokotov and Yu. M. Yablonokiy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 251-256 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 265-270 (For availability see N74-31167 20-23)

N74-31198 Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF THE OUTPUT RESPONSE IN A SIGNAL PROCESSING SYSTEM WITH HYPERBOLIC FREQUENCY MODULATION
Ye. B. Libensen *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 266-275 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 281-290 (For availability see N74-31167 20-23)

N74-31199 Joint Publications Research Service, Arlington, Va.
MUTUAL CORRELATION PROCESSING OF NARROWBAND SIGNALS BASED ON FAST FOURIER TRANSFORMATION
I. B. Vaysman and K. P. Lvov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 276-278 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 291-293 (For availability see N74-31167 20-23)

N74-31201 Joint Publications Research Service, Arlington, Va.
DECREASING THE EFFECT OF MULTIPLICATIVE NOISE BY USING AUTOMATED CONTROL
N. V. Karpov and V. V. Yaromenko *In its* Works of the 4th

All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 286-290 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 300-304 (For availability see N74-31167 20-23)

N74-31202 Joint Publications Research Service, Arlington, Va.
ERRORS IN MEASURING THE CHARACTERISTICS OF SIGNALS WITH STORAGE ON MAGNETIC RECORDERS
N. V. Karpov and V. P. Peshkovfrom *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 291-297 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 305-312 (For availability see N74-31167 20-23)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-30542 Technische Hochschule, Darmstadt (West Germany).
TIME CALCULATIONS FOR PERIPHERIC MEMORIES. PERFORMANCE BEHAVIOR PREDICTIONS FOR THE INPUT/OUTPUT MODES OF DATA PROCESSING SYSTEMS Ph.D. Thesis [ZEITBERECHNUNGEN ZUR VORHERSAGE DES BETRIEBSVERHALTENS EINES DATENVERARBEITUNGS-SYSTEMS IM EIN-/AUSGABE-BEREICH]
Rainer Bastian 1972 141 p refs In GERMAN
Copyright. Avail: Issuing Activity

Methods are developed for predicting the real time operation of a data processing memory that is applicable to systems analysis, feasibility studies, logical design, physical design and systems implementation, and systems operation. Sequencing access times and revolving delay times in the operation of random and index sequential processes are considered. Transl. by G.G.

N74-30543 North Carolina State Univ., Raleigh.
DESIGN, IMPLEMENTATION, AND TESTING OF A SATELLITE COMPUTER SYSTEM Ph.D. Thesis
Richard Woodrow Kistler 1974 146 p
Avail: Univ. Microfilms Order No. 74-19007

To avoid high cost, a satellite system is proposed. Such a system consists of a medium sized, fast data acquisition computer attached to a large scale data processor. A survey of campus needs for a data acquisition and control system is made. From the results of the survey, specifications are written for a computer system containing an IBM system/7 satellite computer and an IBM 370/165 large data processor. Software for the satellite computer is written. Several low cost methods are studied for attaching instruments in remote locations to the satellite computer. After the satellite computer system was up and running, a preliminary and final estimate of cost feasibility was made. Dissert. Abstr.

N74-30544# RAND Corp., Santa Monica, Calif.
RUDIMENTS OF A REAL-WORLD THEORY OF MAN-COMPUTER PROBLEM SOLVING
Harold Sackman Apr. 1974 39 p refs
(Grant NSF GJ-32759)
(R-1491-NSF) Avail: NTIS HC $5.00

This work was concerned with survey analyses of real world problem solving with and without computers primarily in research settings. Promising leads were gleaned, indicating (1) fundamentally similar general stages and dynamics of problem solving with and without computers; (2) the central importance of the individual for basic problem insight, effective use of computers, and successful problem solutions; (3) widespread dissatisfaction with inflexible software and poor computer solutions; and (4) empirical demonstration of the reliability and validity of a nine-stage model of problem solving drawn from planning and system theory. These promising results provide encouraging prospects for an integrative theory of man-computer problem solving in the natural environment of the user. Author

N74-30545# RAND Corp., Santa Monica, Calif. Information Sciences Dept.
EXCEPTION REPORTING: AN AID TO THE COMPUTER PERFORMANCE ANALYST
Eugene Seals Mar. 1974 15 p refs
(P-5199) Avail: NTIS HC $4.00

The problem of the selection of application programs for computer analysis and modification is analyzed. The approach commonly taken in search of a solution is discussed and a new approach is suggested. An example is presented of the exception-reporting concept, using actual data from production facilities. Author

N74-30546# RAND Corp., Santa Monica, Calif.
A PROTOTYPE SYSTEM FOR INTERACTIVE DATA ANALYSIS
Gerald Levitt, David H. Stewart, and Beatrice Yormark Apr. 1974 31 p refs Presented at the Natl. Computer Conf., 6 May 1974
(P-5115) Avail: NTIS HC $4.75

The prototype system described aids the researcher in accessing data and is useful in the interactive application of a wide range of analytic techniques. The following advantages are identified: (1) ability to review the raw data in tabular and graphical form; (2) allowance for additions or deletions from the basic data base; (3) flexibility for the subset and restructuring of data for hypothesis testing and formulation; and (4) applicability to many of the standard statistical tests. Design concepts are discussed including data analysis concepts, information language, and user interface. Information is also provided on the functional characteristics of the system and includes a description of the initial display context, and guidelines for the selection of sets and attributes, loading the data analysis data base, and creation, description, and analysis of sets. Implementation of the system is briefly discussed. A.A.D.

N74-30547# Technische Hogeschool, Eindhoven (Netherlands).
AUTOMATIC DESIGN OF DIGITAL SYSTEMS Ph.D. Thesis
Jacobus Hoogeveen 14 Sep. 1973 192 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC $12.75

The design of digital systems with the capabilities provided by digital computers is discussed in terms of the DSL2 programming language in which it is possible to define both small and large systems. DSL2 operates in a design phase in which it transforms input into symbolic circuits. A realization phase is then possible in which a description in symbolic circuits is converted to specifications of real circuits. DSL2 also provides the capability of simulating the design system. Author

N74-30548# National Bureau of Standards, Washington, D.C. Systems and Software Div.
CODASYL DATA DESCRIPTION LANGUAGE. JOURNAL OF DEVELOPMENT, JUNE 1973
Jan. 1974 150 p
(NBS-Handbook-113) Avail: SOD HC $1.70 as C13.6/2:113

The approved Data Description Language specifications contain the syntax and semantic rules that permit the description of the structure and contents of a data base in a language independent of, but common to, many other high level programming languages. The language specifications will have a significant impact on the development of functionally compatible data base management systems and will increase the portability of programs between different computer systems. Author

N74-30549*# National Aeronautics and Space Administration. Pasadena Office, Calif.
COMPUTER INTERFACE SYSTEM Patent Application
Filed 5 Aug. 1974 26 p
(Contract NAS7-100)
(NASA-Case-NPO-13428-1; NASA-Case-NPO-13447-1; US-Patent-Appl-SN-495022) Avail: NTIS HC $4.50 CSCL 09B

An interface logic circuit permitting the transfer of information between two computers having asynchronous clocks is disclosed. The information transfer involves utilization of control signals (including request, return-response, ready) to generate properly

timed data strobe signals. Noise problems are avoided because each control signal, upon receipt, is verified by at least two clock pulses at the receiving computer. If control signals are verified, a data strobe pulse is generated to accomplish a data transfer. Once initiated the data strobe signal is properly completed independently of signal disturbances in the control signal initiating the data strobe signal. Completion of the data strobe signal is announced by automatic turn-off of a return-response control signal. NASA

N74-30550*# Rice Univ., Houston, Tex. Dept. of Economics and Mathematical Sciences.
FINITE PURE INTEGER PROGRAMMING ALGORITHMS EMPLOYING ONLY HYPERSPHERICALLY DEDUCED CUTS Final Report
Richard D. Young 3 May 1971 25 p refs
(Grant NGR-44-006-128)
(NASA-CR-139561) Avail: NTIS HC $4.25 CSCL 09B

Three algorithms are developed that may be based exclusively on hyperspherically deduced cuts. The algorithms only apply, therefore, to problems structured so that these cuts are valid. The algorithms are shown to be finite. Author

N74-30551*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GSE, DATA MANAGEMENT SYSTEM PROGRAMMERS/USER' MANUAL
Ronald A. Schlagheck, Bert D. Dolerhie, Jr., and Fred J. Ghiglieri Jun. 1974 110 p
(NASA-TM-X-64862) Avail: NTIS HC $4.50 CSCL 09B

The GSE data management system is a computerized program which provides for a central storage source for key data associated with the Mechanical Ground Support Equipment (MGSE). Eight major sort modes can be requested by the user. Attributes that are printed automatically with each sort include the GSE end item number, description, class code, functional code, fluid media, use location, design responsibility, weight, cost, quantity, dimensions, and applicable documents. Multiple subsorts are available for the class code, functional code, fluid media, use location, design responsibility, and applicable document categories. These sorts and how to use them are described. The program and GSE data bank may be easily updated and expanded. Author

N74-30552*# Alabama Univ., University. Bureau of Engineering Research.
A FAST-INITIALIZING DIGITAL EQUALIZER WITH ON-LINE TRACKING FOR DATA COMMUNICATIONS Final Report
Ronald C. Houts and William J. Barksdale May 1974 146 p refs
(Contract NAS8-20172)
(NASA-CR-120312; TR-166-102) Avail: NTIS HC$10.50 CSCL 09B

A theory is developed for a digital equalizer for use in reducing intersymbol interference (ISI) on high speed data communications channels. The equalizer is initialized with a single isolated transmitter pulse, provided the signal-to-noise ratio (SNR) is not unusually low, then switches to a decision directed, on-line mode of operation that allows tracking of channel variations. Conditions for optimal tap-gain settings are obtained first for a transversal equalizer structure by using a Mean Squared Error (MSE) criterion, a first order gradient algorithm to determine the adjustable equalizer tap-gains, and a sequence of isolated initializing pulses. Since the rate of tap-gain convergence depends on the eigenvalues of a channel output correlation matrix, convergence can be improved by making a linear transformation on to obtain a new correlation matrix. Author

N74-30553*# Michigan Univ., Ann Arbor. Dept. of Computer and Communication Sciences.
CONVERGENCE PROPERTIES OF SIMPLE GENETIC ALGORITHMS
Albert D. Bethke, Bernard P. Zeigler, and David M. Strauss Jul. 1974 44 p refs
(Grant NGR-23-005-602)
(NASA-CR-139560; TR-159) Avail: NTIS HC $5.25 CSCL 09B

The essential parameters determining the behaviour of genetic algorithms were investigated. Computer runs were made while systematically varying the parameter values. Results based on the progress curves obtained from these runs are presented along with results based on the variability of the population as the run progresses. Author

N74-30554*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
BASIC MEMORY MODULE Final Report
F. C. Tietze 30 Jun. 1974 48 p ref
(Contract NAS8-30460)
(NASA-CR-120392; IBM-74-585-008) Avail: NTIS HC $5.50 CSCL 09B

Construction and electrical characterization of the 4096 x 2-bit Basic Memory Module (BMM) are reported for the Space Ultrareliable Modular Computer (SUMC) program. The module uses four 2K x 1-bit N-channel FET, random access memory chips, called array chips, and two sense amplifier chips, mounted and interconnected on a ceramic substrate. Four 5% tolerance power supplies are required. At the Module, the address, chip select, and array select lines require a 0-8.5 V MOS signal level. The data output, read-strobe, and write-enable lines operate at TTl levels. Although the module is organized as 4096 x 2 bits, it can be used in a 8196 x 1-bit application with appropriate external connections. A 4096 x 1-bit organization can be obtained by depopulating chips. Author

N74-30555# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
MANMOD: A COMPUTER PROGRAM FOR STATISTICAL ANALYSIS OF DYNAMICAL SYSTEMS INVOLVING MAN AS A CONTROLLER Final Report
Sheldon Baron and Jeffrey E. Berliner Feb. 1974 166 p refs
(Contract DAAH01-73-C-0526; DA Proj. 1M2-62303-A-214)
(AD-779461; BBN-2704; RD-74-4) Avail: NTIS CSCL 15/3

MANMOD is a digital computer program that is designed to predict operator/system response during a compensatory tracking task. The program is specifically tailored to handle manned operation of missile weapons systems, where the quality and nature of the displayed information, the characteristics of platform and/or target induced motion, and the operator response strategy change with time. Thus, MANMOD can be used to study time-dependent effects, such as disturbance variations, instrument switchovers, and temporary loss of the optical target signal. In addition, the incorporation of displayed-related threshold and resolution limitations allows one to study, with reasonable fidelity, the effects of instrument modification. (Modified author abstract) GRA

N74-30556# Rensselaer Polytechnic Inst., Troy, N.Y. Systems Engineering Div.
THE APPLICATION AND COMPARISON OF FEATURE EXTRACTION AND DIGITAL SIGNAL PROCESSING METHODS TO RECONNAISSANCE DATA Interim Report, 1 Jan. 1973 - 31 Jan. 1974
Lester A. Gerhardt 31 Jan. 1974 62 p refs
(Grant AF-AFOSR-2486-73; AF Proj. 9769)
(AD-779043; AFOSR-74-0749TR) Avail: NTIS CSCL 09/4

The research is concerned with the feature extraction, encoding, transmission, and interpretation of two different classes of reconnaissance information. The first type is temporal signals and is typified by acoustic, magnetic, and seismic sources. The second is imagery data and includes video, IR, and radar displays. Stress is placed on real time on-line digital processing of these types of information. During the first year, adaptive techniques have been developed for enhancing, extracting, and tracking nonstationary signals typical of the first class of sensors. Digital processing and interactive computer graphics for displaying the time varying spectrum is used to test the analytical results experimentally. Second, design techniques have been found which permit the design of long binary signals, particularly useful for synchronization, having prespecified autocorrelation properties using only shorter waveforms with desireable properties. (Modified author abstract) GRA

N74-30557# Stanford Research Inst., Menlo Park, Calif.
PAJARO DUNES WORKSHOP ON AUTOMATIC PROBLEM SOLVING Final Report, 29 Jan. - 30 Jan. 1973
Nils J. Nilsson Jul. 1973 26 p refs

(Contract N00014-73-C-0245; SRI Proj. 2527)
(AD-779307; SRI-2527-FR) Avail: NTIS CSCL 09/2

Automatic problem solving is a key area of research in Artificial Intelligence (A.I.). It is anticipated that advances in this field will lead to computer systems with much more flexibility and problem-solving power. Developments in this field have an impact on systems for information, retrieval, language understanding, mathematical theorem proving, speech recognition and understanding, and command and control. The several projects on robot systems, for example, draw directly on research in automatic problem solving. The report presents a brief summary of the workshop proceedings. GRA

N74-30558# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
RESEARCH INITIATION: A THEORETICAL INVESTIGATION OF DIAGNOSABLE LOGIC SYSTEMS Final Report, May 1972 - Dec. 1973
Festus G. Gray and B. A. Prasad Dec. 1973 123 p refs
(Grant NSF GJ-32718)
(PB-230444/2) Avail: NTIS HC $9.25 CSCL 09B

Research is described on the solution of problems incurred in the design, analysis, and diagnosis of reliable computing systems. The ultimate goal of such research is to develop a formal theory of faulty systems that will serve engineers concerned with the design of diagnosable systems, much as classic switching theory serves those concerned only with fault-free systems. GRA

N74-30710* Purdue Univ., Lafayette, Ind.
AN EVALUATION OF MACHINE PROCESSING TECHNIQUES OF ERTS-1 DATA FOR USER APPLICATIONS
David Landgrebe *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 41-73 refs (For availability see N74-30705 20-13)
(Contract NAS5-21773; Grant NGL-15-005-112)
(Paper-A3) CSCL 09B

N74-30729* National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
COMPUTER-IMPLEMENTED LAND USE CLASSIFICATION WITH PATTERN RECOGNITION SOFTWARE AND ERTS DIGITAL DATA
Armond T. Joyce *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 331-337 (For availability see N74-30705 20-13)
(Paper-L1) CSCL 09B

N74-30817* Canadian Center for Remote Sensing, Ottawa (Ontario).
AFFINE TRANSFORMATIONS FROM AERIAL PHOTOS TO COMPUTER COMPATIBLE TAPES
F. G. Peet, A. R. Mack (Dept. of Agr., Ottawa), and L. S. Crosson (Dept. of Agr., Saskatoon) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1719-1724 (For availability see N74-30774 20-13)
(Paper-I3) CSCL 02C

N74-30818* Stanford Research Inst., Menlo Park, Calif.
ESIAC: A DATA PRODUCTS SYSTEM FOR ERTS IMAGERY (TIME-LAPSE VIEWING AND MEASURING)
William E. Evans and Sidney M. Serebreny *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1725-1741 (For availability see N74-30774 20-13)
(PAPER-I4) CSCL 05B

N74-30819* Environmental Research Inst. of Michigan, Ann Arbor.
ADVANCED PROCESSING AND INFORMATION EXTRACTION TECHNIQUES APPLIED TO ERTS-1 MSS DATA
William A. Malila and Richard F. Nalepka *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1743-1772 refs (For availability see N74-30774 20-13)
(Paper-I5) CSCL 05B

N74-30821* Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS
Robert H. Rogers, Keith Peacock, and Navinchandra J. Shah *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1787-1804 refs (For availability see N74-30774 20-13)
(Paper-I7) CSCL 05B

N74-30822* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
THE PENN STATE ORSER SYSTEM FOR PROCESSING AND ANALYZING ERTS DATA
G. J. McMurtry, F. Y. Borden, H. A. Weeden, and G. W. Petersen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1805-1822 (For availability see N74-30774 20-13)
(Paper-I8) CSCL 05B

N74-30823* TRW Systems, Redondo Beach, Calif.
ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION
Curtis L. May *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1823-1835 refs (For availability see N74-30774 20-13)
(Paper-I9) CSCL 05B

N74-30824* TRW Systems, Redondo Beach, Calif.
EVALUATION OF DIGITALLY CORRECTED ERTS IMAGES
John E. Taber *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1837-1843 (For availability see N74-30774 20-13)
(Paper-I10) CSCL 09B

N74-30828* International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
SCENE CORRECTION (PRECISION TECHNIQUES) OF ERTS SENSOR DATA USING DIGITAL IMAGE PROCESSING TECHNIQUES
Ralph Bernstein *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1909-1928 refs (For availability see N74-30774 20-13)
(Paper-I14) CSCL 09B

N74-31045 Joint Publications Research Service, Arlington, Va.
PROBLEMS OF THE MACHINE APPROXIMATION OF THE CHARACTERISTICS OF STOCHASTIC PROCESSES
V. Ya. Rozenberg *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 15-25 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 17-27 (For availability see N74-31043 20-19)

N74-31049 Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF THE QUALITY OF COMPLEX SYSTEMS (A SURVEY)
G. Ya. Goldshteyn *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 42-46 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Projtsessov i Poley" Novosibirsk, 1968 p 44-48 (For availability see N74-31043 20-19)

N74-31066 Joint Publications Research Service, Arlington, Va.
MACHINE RECOGNITION OF SITUATIONS IN FLOWS OF HOMOGENEOUS EVENTS
Ye. A. Obidenko and L. I. Torokhova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 120-121 Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 124-125 (For availability see N74-31043 20-19)

N74-31186 Joint Publications Research Service, Arlington, Va.
ALGORITHMS FOR OPTIMAL SPACE-TIME PROCESSING OF RANDOM FIELDS
N. G. Gatkin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 172-194 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 168-200 (For availability see N74-31167 20-23)

N74-31203 Joint Publications Research Service, Arlington, Va.
PROCESSING SOME NONSTATIONARY PROCESSES ON A DIGITAL COMPUTER
I. I. Shilovich, A. M. Zemskov, Yu. P. Makarenko, and B. Ya. Li *In its* Works of the 14th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 298-305 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 313-321 (For availability see N74-31167 20-23)

N74-31218 Joint Publications Research Service, Arlington, Va.
A SPECIALIZED DIGITAL COMPUTER FOR CORRELATION ANALYSIS
G. Sh. Avetisov *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 161-164 Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 181-185 (For availability see N74-31207 20-23)

N74-31219 Joint Publications Research Service, Arlington, Va.
METHODS OF IMAGE RECOGNITION AND POSSIBILITIES OF THEIR APPLICATION IN HYDROACOUSTICS
N. G. Zagoruyko *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 165-171 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 186-193 (For availability see N74-31207 20-23)

N74-31221 Joint Publications Research Service, Arlington, Va.
FORMATION OF AN INFORMATIVE SYSTEM OF SIGNS FOR SIGNAL RECOGNITION
T. N. Gadi and V. I. Kotyukov *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS62406) 5 Jul. 1974 p 174-177 refs Transl. into ENGLISH from the book 'Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 196-200 (For availability see N74-31207 20-23)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-30559 British Library Lending Div., Boston Spa (England).
STUDY OF THE RELATIONSHIP BETWEEN INTERFACE STATES AND CHARGE PUMPING EFFECT IN MOS TRANSISTORS
J. Golder and E. Baldinger 4 Feb. 1974 17 p refs Transl. into ENGLISH from Helv. Phys. Acta (Switzerland), v. 44, 1971 p 387-400
(BLL-Trans-3040-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The charge pumping effect in enhancement-mode metal oxide semiconductor transistors is discussed. The made is associated with the occupation of interface states, and with bulk recombination. In the usual MOS transistors, the interface contribution predominates significantly. The surface concentration of holes and electrons vary chiefly through diffusion between surface and drain and source regions of the bulk substrate. Mathematical models are developed to show the electrical performance. The charge pumping effect becomes evident when a periodic change in the gate potential produces an average substrate current different from zero. Author

N74-30560 British Library Lending Div., Boston Spa (England).
THE STATIC CHARACTERISTICS OF METAL-OXIDE-METAL DIODES
A. Ya. Leiken, A. A. Rivlin, V. S. Solovev, and L. B. Vatova Feb. 1974 4 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 18, no. 4, 1973 p 652-654
(BLL-RTS-8734) Avail: British Library Lending Div. Boston Spa, Engl.: 1 BLL photocopy coupon

The use of metal-semiconductor diodes for studying submillimeter and far infrared radiation bands in the shortwave region is discussed. The phenomena which determine the detection processes in the metal-oxide-metal diode are analyzed. The existence of different mechanisms of current transmission in the point contact system of the MOM diode is described. The mechanisms are identified as the tunnel mechanism and the Schottly current effect. Mathematical models are developed to show the operation of the diodes for both types of mechanisms. Author

N74-30561 British Library Lending Div., Boston Spa (England).
ELECTROCHEMICAL APPLICATIONS OF FLUIDIZED BED ELECTRODES
T. Hirai Feb. 1974 60019 p refs Transl. into ENGLISH from Denki Kagaku Oyobi Kogyo Butsuri Kagaku (Japan), v. 40, no. 9, 1972 p 627-631
(BLL-RTS-8777) Avail: British Library Lending Div., Boston Spa, Engl.: 6 BLL photocopy coupons

A method for promoting contact in a solid-liquid heterogeneous reactor by using a fluidized bed process is discussed. The process seeks to fluidize the solid particle bed with a flowing liquid. The specific application is to effect electrode reactions on the individual solid particles by direct or indirect electrical contact between fluidized electrically conducting particles and a separately provided collector. The significance, form, and function of the fluidized electrodes are analyzed. The special features of the fluidized bed are listed. Author

N74-30562 Detroit Univ., Mich.
A STABILIZATION AND CONTROL SYSTEM FOR A MICROWAVE RADIOMETRIC SENSOR Ph.D. Thesis
Samuel Clyde Lambert 1974 274 p
Avail: Univ. Microfilms Order No. 74-17221

The design, development, and evaluation are reported of a stabilization and control subsystem that is capable of interfacing with a microwave radiometric sensor subsystem to form a complete guidance package which is amenable to small missile airframes. The design incorporates the following features: (1) provides line-of-sight (LOS) rate information; (2) stabilizes the sensor when confronted with airframe disturbances; (3) resolves LOS rate information into two plane control commands; (4) roll stabilizes the submissile airframe; (5) enables the sensor to search the terrestrial surface for a target; (6) utilizes the sensor's output and causes the sensor to track a target; and (7) is self-contained, remotely located, and compatible with a microwave sensor. In addition, an airframe control system design capable of utilizing the information provided by the SCSS is included.
Dissert. Abstr.

N74-30563 British Library Lending Div., Boston Spa (England).
AN EXPERIMENTAL STUDY OF FREQUENCY DISTORTIONS OF SIGNALS IN FREQUENCY-MODULATED OSCILLATORS AT HIGH MODULATION RATES
V. G. Sokolinsky 1973 5 p refs Transl. into ENGLISH from Radiotekh. Elektron. (USSR), v. 18, pt. 10, 1973 p 2194- 2195
(BLL-Trans-3071-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A comparative research was carried out on the frequency distortions of signals occurring during the modulation of the two types of oscillators. The oscillators were: (1) a microwave oscillator on a reflex klystron and (2) a traveling wave tube with external feedback. The spectral method of measurement was used in the research. The measurements showed that there was no appreciable nonuniformity in the frequency characteristic, within the frequency range under consideration, during frequency modulation of an oscillator on a reflex klystron. The deviation frequency characteristic for an oscillator on a travelling wave tube is shown in graph form. Author

N74-30564 British Library Lending Div., Boston Spa (England).
SIGNAL DISTORTIONS IN Si AVALANCHE MESAPHOTODIODES
O. Krumpholz [1973] 21 p refs Transl. into ENGLISH from Arch. Elek. Uebertrag. (West Germany), v. 27, no. 9, Sep. 1973 p 361-367
(BLL-Trans-3058-(9022.81)) Avail: British Library Lending Div.,

Boston Spa, Engl.: 3 BLL photocopy coupons

The amplification of avalanche photodiodes decreases with increasing light power, due to the space charge of the charge carriers generated. This nonlinear relationship between photo current and light intensity causes signal distortions. It is shown that the bandwidth of avalanche photodiodes decreases with increasing amplification. An avalanche photodiode with large bandwidth needs a small avalanche zone with high electric field strength. An additional drift region beside the avalanche zone diminishes considerably the bandwidth, primarily at low amplifications. Author

N74-30565 British Library Lending Div., Boston Spa (England).
PULSE RESPONSE AND NOISE CHARACTERISTICS OF PHOTODIODE RECEIVER FRONT ENDS
J. Riegl [1973] 11 p refs Transl. into ENGLISH from Arch. Elektron. Uebertragungs - Technik, v. 27, no. 9, Sep. 1973 p 375-378
(BLL-Trans-3057-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

An electrical equivalent circuit is derived for an optical pulse receiver. The properties of the input circuit and those of the following amplifier are combined in an overall equivalent circuit. Calculations of curve and signal to noise ratio at the receiver output were made. The method of calculation aids in designing photodiode front ends. Mathematical models are developed to show the characteristics of signal transmission, electronic noise levels, and modifying the shape of the output signal. Author

N74-30566 British Library Lending Div., Boston Spa (England).
ADJUSTMENT OF CARRIER-LIFE IN THYRISTOR STRUCTURES. 1: SHORT LIFE
J. L. Lambert 27 Feb. 1974 34 p refs Transl. into ENGLISH from Wiss. Ber. AEG-Telefunken (West Ger.), v. 45, no. 4, 1972 p 153-162 In ENGLISH and GERMAN
(BLL-Trans-888-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

The controlled adjustment of the gold concentration in diffused silicon wafers by solid-body diffusion is discussed. The effect on the predetermined reduction of the carrier life is described. Emphasis is placed on the problems encountered in thyristor technology. The subjects involved in the analysis are: (1) the reproducibility of the gold-diffusion process, (2) the mechanism of gold diffusion is silicon, and (3) the dependence of the center section area upon the diffusion time in silicon rich dislocations. Author

N74-30567*# Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT AND UTILIZATION OF TECHNOLOGY, CONTRIBUTIONS FROM NASA LIFE SUPPORT SYSTEMS: BRUSHLESS dc MOTORS Final Report
3 May 1974 73 p refs
(Contract NASw-2454; MRI Proj. 3720-D)
(NASA-CR-139392) Avail: NTIS HC $5.25 CSCL 09A

Starting from a specific knowledge contribution identified from an analysis of astronaut life support requirements, the origins, adaptations, and eventual significance of the new technology is presented. Author

N74-30568# Technische Universitaet, Brunswick (West Germany).
PRODUCTION AND PROPERTIES OF PLANAR X-BAND GUNN ELEMENTS Ph.D. Thesis
Dieter Ullrich 16 Mar. 1973 112 p refs
Avail: NTIS HC $8.75

The production of planar X-band Gunn elements by using epitaxial deposited GaAs layers as metal contacts is reported. Circular planar Gunn elements were constructed in such a way that the median temperature in the active zone remained at 200 C. Differing surface treatments as deposition of silicon nitride, natural oxidation of the GaAs surface by boiling in water and noise studies on elements with plane parallel contacts, show that most noise sources are at the gallium arsenide surface. Higher levels for the current- and frequency-modulated noise in planar elements, as compared with sandwich elements, are attributed to some extend to free GaAs surfaces. Transl. by G.G.

N74-30569# Technische Universitaet, Brunswick (West Germany).
CONTRIBUTION TO THE N-PATH-FILTER THEORY Ph.D. Thesis [BEITRAG ZUR THEORIE DER •]-PFAD-FILTER]
Gerhard Reinhold 1973 58 p refs In GERMAN
Avail: NTIS HC $6.00

A method is reported for calculating the frequency behavior of N-path filters with cyclically switched capacities by forming an equation of state, determining the time variant transfer function and the stationary solution for the equation of state, and by developing a Fourier series solution. Transl. by G.G

N74-30570# Technische Universitaet, Brunswick (West Germany).
PRODUCTION AND NOISE BEHAVIOR OF X-BAND GUNN OSCILLATORS OF SANDWICH CONSTRUCTION Ph.D. Thesis [HERSTELLUNG AND RAUSCHVERHALTEN VON X-BAND GUNN-OSZILLATOREN IN SANDWICH -BAUWEISE]
Attica Ataman 1973 95 p refs In GERMAN
Avail: NTIS HC $7.75

Contact problems during production of multiple Gunn elements are discussed and various contact materials are tested for their heat transmission in conventional and sandwich structures. It is shown that elements produced by an upside down technique insure effective heat transmission from active gallium arsenide layers. High frequency modulation noise of Gunn oscillators is attributed to independent eigen-noise formed by charge carrier density concentration fluctuations. The diffusion noise in Gunn oscillators is considered the primary high frequency noise source. Transl. by G.G.

N74-30571# Technische Universitaet, Munich (West Germany).
EFFECT OF AN ADDITIVE GRADIENT ON THE CAPACITY OF A MOS DIODE, ON THE THRESHOLD VOLTAGE OF MOS TRANSISTORS, AND ON THE DETERMINATION OF BOUNDARY LAYER PROPERTIES Ph.D. Thesis [EINFLUSS EINES DOTIERUNGSGRADIENTEN AUF DIE KAPAZITAET EINER MOS-DIODE, AUF DIE SCHWELLSPANNUNG VON MOS-TRANSISTOREN UND AUF DIE BESTIMMUNG VON GRENZFLAECHENZUSTAENDEN]
Helmut Feltl 21 Sep. 1973 120 p refs In GEORGIAN
Avail: NTIS HC $9.00

The additive profile close to the semiconducting surface affects MOS transistor properties. An analytical solution to the Poisson equation is used to calculate shifts in transistor threshold voltage caused by diffused additive atoms or implanted ions. Conditions are formulated where the threshold voltage shift is propertional to injected ions independent from the additive profile. Transl. by G.G.

N74-30572# Elektronikcentralen, Hoersholm (Denmark).
PLASTIC CAPACITORS: A QUALITATIVE SURVEY OF 31 FABRICATION TYPES WITH 5 DIFFERENT FORMS OF DIELECTRICS [PLASTKONDENSATORER: EN KVALITETSSAMMENLIGNENDE UNDERSOGELSE AF 31 FABRIKATER OG TYPER MED 5 FORSKELLIGE FORMER FOR DIELEKTRIKUM]
U. Fabricius May 1974 58 p In DANISH; ENGLISH summary
(ECR-41) Avail: NTIS HC $6.00

31 different types of capacitors distributed over 13 different manufactures are included in the test. Represented are the various existing kinds of dielectrics, as well as both the metallized and the foiled types. Thus 4 different kinds of plastic dielectrics plus paper are contained in the test. Ac- and dc-life tests at max. temperature enter into the test plan as a part of the climatic environment exposures in order to examine a possible difference in the stability of the capacitors in the two different kinds of life tests. The test show that several of the capacitors manage on ac-life test better than a dc-life test. A pulse test of the capacitors with a dV/dt of max. 700V/microseconds shows great dispersion among and within the various manufactures; the foiled types prove in general to manage better than the metallized types. Author

N74-30573*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE NASA/JPL 64-METER-DIAMETER ANTENNA AT

GOLDSTONE, CALIFORNIA: PROJECT REPORT, TECHNICAL STAFF, TRACKING AND DATA ACQUISITION ORGANIZATION
15 Jul. 1974 203 p refs
(Contract NAS7-100)
(NASA-CR-139385; JPL-TM-33-671) Avail: NTIS HC $13.25 CSCL 09E

The significant management and technical aspects of the JPL Project to develop and implement a 64-meter-diameter antenna at the Goldstone Deep Space Communications Complex in California, which was the first of the Advanced Antenna Systems of the National Aeronautics and Space Administration/Jet Propulsion Laboratory Deep Space Network are described. The original need foreseen for a large-diameter antenna to accomplish communication and tracking support of NASA's solar system exploration program is reviewed, and the translation of those needs into the technical specification of an appropriate ground station antenna is described. The antenna project is delineated by phases to show the key technical and managerial skills and the technical facility resources involved. There is a brief engineering description of the antenna and its closely related facilities. Some difficult and interesting engineering problems, then at the state-of-the-art level, which were met in the accomplishment of the Project, are described. The key performance characteristics of the antenna, in relation to the original specifications and the methods of their determination, are stated. Author

N74-30574*# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
DEVELOPMENT OF A GAS PRESSURE BONDED FOUR-POLE ALTERNATOR ROTOR Final Report
G. G. Lessmann and W. A. Bryant Apr. 1972 81 p refs
(Contract NAS3-11837)
(NASA-CR-120923; WANL-M-FR-72-002) Avail: NTIS HC $7.25 CSCL 09E

Methods were developed for fabrication of a solid four pole alternator rotor by hot isostatic pressure welding. The rotor blanks welded in this program had complex geometrical mating interfaces and were of considerable bulk, being approximately 3-1/2 inches (0.089 meters) in diameter and 14 inches (0.356 meters) long. Magnetic end pieces were machined from AISI 4340 steel, while the non-magnetic central section was of Inconel 718. Excellent welds were produced which were shown to be responsive to post weld heat treatments which substantially improved joint strength. Prior to welding the rotors, test specimens of complex geometry were welded to demonstrate that complex surfaces with intentional mechanical misfit could be readily joined using HIP welding. This preliminary work demonstrated not only that interface compliance is achieved during welding but that welding pressure is developed in these thick sections sufficient to produce sound joints. Integral weld-heat treatment cycles were developed that permitted the attainment of magnetic properties while minimizing residual stress associated with the allotropic transformation of 4340 steel. Author

N74-30575*# Varian Associates, Palo Alto, Calif. Tube Div.
DESIGN, CONSTRUCTION AND EVALUATION OF A 12.2 GHz, 4.0 kW-CW HIGH EFFICIENCY KLYSTRON AMPLIFIER Final Report
J. M. Vishida and L. K. Brodersen Aug. 1974 74 p refs
(Contract NAS3-13276)
(NASA-CR-134659) Avail: NTIS HC $6.75 CSCL 09E

An analytical and experimental program is described, for studying design techniques for optimizing the conversion efficiency of klystron amplifiers, and to utilize these techniques in the development and fabrication of an X-band 4 kW cw klystron, for use in satellite-borne televison broadcast transmitters. The design is based on a technique for increasing the RF beam current by using the second harmonic space charge forces in the bunched beam. Experimental analysis was also made of a method to enhance circuit efficiency in the klystron cavities. The design incorporates a collector which is demountable from the tube to facilitate multistage depressed collector experiments employing an axisymmetric, electrostatic collector for linear beam microwave tubes. Author

N74-30576# Naval Research Lab., Washington, D.C.
A CURSORY INVESTIGATION OF A SLOT LINE RADIATOR Interim Report
M. L. Reuss, Jr. May 1974 10 p refs
(XF52545007)
(AD-779265; NRL-MR-2796) Avail: NTIS CSCL 09/5

A cursory investigation of a slot line radiator operating from S band into X band was performed. Radiation patterns and measured VSWR's equal to or less than 3 to 1 over the frequency band indicate the possible use for broadband MIC applications. Author

N74-30577# Radio Corp. of America, Princeton, N.J. Electro-Optics Lab.
THE 1.06 MICRON INTENSIFIED SILICON TARGET TV CAMERA TUBE Final Report, 7 May 1971 - 7 Jan. 1974
Ramon U. Martinelli, Melvin L. Schultz, Michael Ettenberg, Frederick R. Hughes, and Gilbert N. Butterwick Apr. 1974 113 p refs
(Contract F33615-71-C-1619; AF Proj. 4367)
(AD-779011; PRRL-74-CR-7; AFAL-TR-74-43) Avail: NTIS CSCL 09/1

The objective of this contract was the fabrication and testing of Negative Electron Affinity (NEA) II-V Transmission Secondary Emission (TSE) dynodes which are to be incorporated into a silicon intensifier tube. The photocathode is to be an NEA GaAs semitransparent cathode. A reliable technique for fabricating GaAs dynodes has been developed which employs a combination of chemical and electromechanical etching. Uniformly thin smooth 0.5- to 0.8-cm diameter TSE dynodes 2 to 10 micrometers thick have been made. TSE gains of 2 to 20 have been observed in the 5- to 8-keV primary energy range for flat-band GaAs TSE dynodes. The low gains at these energies are the direct result of very high surface recombination velocities at the inactive surface. Seven image tubes have been built: five proximity-focused image intensifier tubes and two SIT tubes with a GaAs photocathode and a GaAs TSE dynode. The design and fabrication of each of these tubes are discussed. Author (GRA)

N74-30578# Stanford Univ., Calif. Microwave Lab.
MICROWAVE ACOUSTIC AND BULK DEVICE TECHNIQUE STUDIES Interim Report, 1 May - 31 Oct. 1973
Mar. 1974 61 p refs
(Contract F30602-71-C-0125; AF Proj. 5573)
(AD-779008; ML-2236; RADC-TR-74-34) Avail: NTIS CSCL 09/1

Work on the deposition of ZnO has been very successful in determining the optimum conditions for growth on a variety of substrates using electron microscopy. The ZnO films are now suitable for device work, and are being used in two projects aimed at greatly improving the efficiency of surface acoustic wave convolvers of completely monolithic design. One uses surface acoustic waves on epitaxial GaAs, excited by means of interdigital transducers deposited on ZnO film overlays, and has produced an improvement in convolution efficiency of more than 20 db. The second device, which is now being designed, will use a ZnO layer completely covering an oxidized epitaxial Si layer, with convolver action occurring at the ZnO-Si interface. Several significant theoretical and experimental advances were made on the L-band bulk acoustic wave parametric convolver/correlator. Measurements have been made of the nonlinear interaction coefficient responsible for convolver action in the $LiNbO_3$ delay line, and of the third order elastic constant responsible for saturation. A time-bandwidth product of 930 has been achieved using the convolver as a pulse compressor on symmetrical V-chirp signals. (Modified author abstract) GRA

N74-30579# Texas Instruments, Inc., Dallas.
A PROGRAMMABLE WIDEBAND PSEUDORANDOM CODED MODEM USING SURFACE ACOUSTIC WAVE DEVICES Final Report, Nov. 1971 - Oct. 1973
Ronald Allison, R. A. Maher, and D. T. Bell, Jr. Mar. 1974 158 p refs
(Contract F30602-72-C-0115)
(AD-779697; TI-DM-73/11-18; RADC-TR-74-53) Avail: NTIS CSCL 09/5

The report contains results of a study in an experimental spread-spectrum communication and IFF system using surface-wave devices. The system uses acoustic surface-wave devices to generate and process signals with bandwidths of 50 MHz and time bandwidth products of about 1000. Coding techniques

employed allow a certain degree of electronic code programmability, address verification, and ability to transmit digital data. Overall intent of this program was to provide a possible technique for application in the general spread-spectrum/CNI (Communication, Navigation, and Identification) arena. Author (GRA)

N74-30580# Electronic Communications, Inc., St. Petersburg, Fla.
HIGH EFFICIENCY UHF POWER AMPLIFIER Final Report
Thomas J. Warnagiris Mar. 1974 63 p refs
(Contract F30602-72-C-0452)
(AD-779694; RADC-TR-74-47) Avail: NTIS CSCL 09/5

The report describes the development and construction of an experimental High Efficiency UHF (225-400 MHz) Power Amplifier. The prime requirements for the amplifier were: 50% overall efficiency; two watt output level for 1 milliwatt input; and, operable over the 225-400 MHz band without mechanical retuning. Author (GRA)

N74-30581# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMIONIC PROPERTIES OF SOLID STATE DEVICE: ENVIRONMENT SYSTEM
I. V. Surant 5 Apr. 1974 9 p refs Transl. into ENGLISH from Poluprov. Prib. Ikh Primen., Sb. Statei (USSR), 1970 p 126-134
(AD-779591; FSTC-HT-23-1659-72) Avail: NTIS CSCL 09/1

The term heatswitch (HS) is defined as a structure of alternating layers of metals and insulators with certain thermal and electrical resistance. The report describes the application of heatswitches for the development of a compact, lightweight and inexpensive solid state device by using common heat sinks or by using the body of the device as a heat sink. GRA

N74-30582# IBM Watson Research Center, Yorktown Heights, N.Y.
MAGNETO-OPTIC EFFECTS AT 1.15 MICROMETER IN Gd(.5)Y(2.5)Ga(1) IRON GARNET THIN FILM WAVEGUIDES Quarterly Technical Report, 1 Aug. - 31 Oct. 1973
Samuel C. Tseng and Axel R. Reisinger May 1974 21 p refs
(Contract N00014-73-C-0256; ARPA Order 2327)
(AD-780446; QTR-3) Avail: NTIS CSCL 09/1

The authors have built an experimental setup which enables them to view the magnetic domains in the film and measure the conversion efficiency simultaneously. Reasonable mode conversion efficiency is obtained, only when the stripe magnetic domains in the film are eliminated along the line of light propagation. The bias field (H(a)) required to annihilate the stripe domain is dependent on the direction of the bias field with respect to the axes of magnetic anisotropy. The annihilation field (H(a)) is found to be maxima, of the order of 50 Oe, at 0, plus or minus 60, plus or minus 120 degrees from the easy axis, and minima of the order of 2 Oe at plus or minus 45 degrees from the hard axis. (Modified author abstract) GRA

N74-30583# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
RA-3B/SONOBUOY SEPARATION PROGRAM Final Report
Carl O. Reitz 31 Dec. 1973 33 p
(AD-780422; NADC-73250-30) Avail: NTIS CSCL 17/1

An analytical and empirical examination of the separation of sonobuoys from the modified RA-3B FuNo. 144833 is presented. A sonobuoy launcher which simulates buoy deployments from the S-3A aircraft has been installed in the RA-3B to provide a capability to test the most severe S-3A launch conditions. A digital computer program was used to examine separation trends and identify configurations to be flight tested. Sonobuoys equipped with parachutes or rotochutes and heavier unretarded buoys with a forward located center of gravity were found to separate safely from the RA-3B at speeds at 425 KIAS. Maximum safe deployment speeds are lower for lighter unretarded sonobuoys, or those with a more centrally located center of gravity. Expressions for the ejection velocity from the RA-3B launchers are also derived. GRA

N74-30584# Microwave Associates, Inc., Burlington, Mass.
LOW MICROWAVE FREQUENCY PASSIVE COMPONENTS Quarterly Status Report no. 2, 1 Jan. - 31 Mar. 1974
C. Buntschuh, J. Miley, N. Jansen, and R. Williams 1974 91 p refs
(Contract N00014-74-C-0066)
(AD-780503) Avail: NTIS CSCL 09/5

The objective of the program is the development of several microstripline components and associated TTL compatible integrated circuit control devices where applicable; 3 db Quadrature hybrid; 20 db directional coupler; SPDT switch; Voltage controlled amplitude modulator; and frequency translator. The second quarter design and development progress of several microwave integrated circuit components is described. (Modified author abstract) GRA

N74-30585# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ON IMPROVING APPROXIMATIONS FOR CURRENT AND CHARGE DISTRIBUTIONS OF CYLINDRICAL DIPOLE ANTENNAS Physical Sciences Research Papers.
Charles J. Drane, Jr. 18 Dec. 1973 31 p refs
(AF Proj. 5635)
(AD-780507; AFCRL-73-0752; AFCRL-PSRP-579) Avail: NTIS CSCL 09/5

Approximate formulas are derived for the current and charge distributions on cylindrical dipole antennas. These formulas are distinguished from derivations of some other authors by being better representations, particularly near the ends and driving point of the dipole, and by being valid over a larger range of electrical lengths. The latter distinction is important in the study of single dipoles operated over a fairly broad band of frequencies, or in the normal operation of an array of dipoles of widely varying lengths. A typical array of this kind is the log-periodic dipole antanna. Sample calculations and graphs of current, charge, and admittance are provided for the purpose of comparing the new representations with the earlier derivations and with experimental results. Author (GRA)

N74-30586# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ON THE LONG CYLINDRICAL ANTENNA Physical Sciences Research Papers
Charles J. Drane, Jr. 8 Feb. 1974 31 p refs
(AF Proj. 5635)
(AD-780509; AFCRL-PSRP-586; AFCRL-TR-74-0080) Avail: NTIS CSCL 09/5

Approximate solutions are derived for current and charge distributions on center-driven, electrically thin, cylindrical dipole antennas. These solutions apply to electrically long dipoles for which the King-Wu three-term theory is apparently not sufficient, although they are equally useful for the shorter dipoles for which the three-term theory is completely satisfactory. They can apply to cases requiring treatment of a broad range of electrical lengths such as, for example, dipoles driven by pulsed rather than steady-state voltages and log-periodic arrays of dipoles. Current and charge distributions are graphed for ten dipoles whose electrical half-lengths cover the range 0.75 (0.25) 3.00 times the wavelength. These theoretical results compare favorably with available experimental values. Author (GRA)

N74-30587# General Electric Co., Philadelphia, Pa. Space Div.
THEORETICAL AND EXPERIMENTAL STUDIES OF SEMICONDUCTOR DEVICE DEGRADATION DUE TO HIGH POWER ELECTRICAL TRANSIENTS Final Technical Report, 6 Mar. 1972 - 31 Dec. 1973
Dante M. Tasca, Joseph C. Peden, and John L. Andrews Dec. 1973 129 p refs
(Contract DAAG39-72-C-0066)
(AD-780160; Doc-735D4289) Avail: NTIS CSCL 09/1

The report presents the results of a study to determine the modes and mechanisms of semiconductor component degradation and failure resulting from high electrical stress transient inputs. Principal areas of investigation were the detailed characterization of such degradation and failure mechanisms in selected discrete, bipolar and unipolar devices and integrated circuits when stressed with high current transients in the nanosecond to microsecond time regime and to investigate the correlation of component failure with non-destructive parameter measurements. A major

area of interest was to experimentally show the utility of square wave pulsed-power damage testing in the prediction of semiconductor device response for complex power waveforms typical of electromagnetic pulse (EMP) induced transients, and to develop basic analytical techniques for prediction of complex power waveform response using square wave response data. GRA

N74-30588# Colorado Univ., Boulder. Dept. of Electrical Engineering.
SYNTHESIS OF HIGH SPEED HOMOPOLAR ALTERNATORS AND THEORY OF SOLID ROTOR ELECTRICAL MACHINES. INVESTIGATION OF DAMPER WINDINGS AND TRANSIENT AND SUBTRANSIENT REACTANCES OF HOMOPOLAR INDUCTOR ALTERNATOR Final Report
Edward A. Erdelyi and Milan Siegl Jun. 1973 395 p refs
(Contract DA-44-009-AMC-787)
(AD-762588) Avail: NTIS HC $6.00 CSCL 09C

The transient reactance of an HIA (homopolar inductor alternators) for the three-phase symmetrical short circuit was derived. The damping effect of the eddy currents in solid iron parts of the HIA's magnetic circuit was studied. Generalized reactances including the eddy current effects were defined and transient reactances considering eddy currents were calculated. The subtransient behavior of an HIA was thoroughly analyzed by studying the four different types of damper windings. Reactances of the windings of an HIA were found from the solution of the nonlinear quasi-Poissonian partial differential equation for the vector potential. Reactances are functions of the rotor position. GRA

N74-30589# General Electric Co., Syracuse, N.Y. Imaging Devices Operation.
DEVELOPMENT OF SHORT-WAVELENGTH INFRARED VIDICON Final Report, 1 Jun. 1972 - 30 Nov. 1973
Hans G. Sippach Feb. 1974 33 p
(Contract F33615-72-C-1974; AF Proj. 6102; AF Proj. 2001)
(AD-780101; AFAL-TR-74-9) Avail: NTIS CSCL 09/1

The original scope of the program was the exploratory development of infrared vidicons using nickel(II)-doped germanium cooled to 65K as a photoconductor. The unsuccessful attempts to attain the proper doping of the sensing layer are described and the reasons why the approach was abandoned are given. The scope of program was switched to the improvement of infrared vidicons using copper(II)-doped germanium cooled to 77K as a photoconductor. The preparation of these sensing layers and detailed processing schedules are described. The successful implementation of a reticulation process yielding increased resolution is outlined and its limitations are described. The performance and construction of the tube are discussed and an analysis of the theoretical sensitivity of both the photoconductor and the vidicon is presented. Measured performance data of two tubes fabricated under this contract are given and their performance is compared to the theoretical limit. Recommendations for future work are made.
Author (GRA)

N74-30590# United Aircraft Corp., East Hartford, Conn. Research Labs.
SPUTTERED THIN FILM RESEARCH Semiannual Technical Report, 1 Oct. 1973 - 30 Apr. 1974
Alexander J. Shuskus, D. J. Quinn, E. L. Paradis, J. M. Berak, and D. E. Cullen May 1974 51 p refs
(Contract N00014-72-C-0415)
(AD-780277; UARL-N921337-12; SATR-4) Avail: NTIS CSCL 09/1

Amorphous films of neodymium ultraphosphate and neodymium lanthanum ultrophosphate have been deposited by r.f. sputtering. Optical waveguide structures were fabricated and scattering losses were measured to be less than one db/cm. Fluorescence lifetime measurements of Nd sup (3 tau) are presented. Data on growth of single crystal films of gallium nitride and tungsten trioxide by reactive sputtering is given. Reduced scattering losses in optical waveguide structures of zinc oxide grown on sapphire have been effected by reduction of secondary electron bombardment of the substrate during film growth. Data is presented on the effect of magnetic field configuration on suppressing secondary electron bombardment and its effect on film uniformity. Author (GRA)

N74-30591# General Electric Co., Syracuse, N.Y. Imaging Devices Operation.
LONG-WAVELENGTH IR VIDICON DEVELOPMENT Final Technical Report, 1 Feb. 1972 - 23 Jul. 1973
Hans G. Sippach May 1974 38 p
(Contract F33615-72-C-1318; AF Proj. 6102; AF Proj. 2001)
(AD-780102; AFAL-TR-74-3) Avail: NTIS CSCL 09/1

The development of extrinsic infrared camera tubes, using zinc(II)-doped germanium cooled to liquid-helium temperature as a photoconductor, is described. The problems in the growth of the starting material and the preparation of the sensing layers are given. The development and application of a reticulation process yielding increased resolution and thus higher sensitivity for subaperture images, are described and its details outlined. The performance and construction of both the electron optics and the tube envelope are discussed and an analysis of the ultimate performance and limitations of such infrared vidicons is presented. Measured performance data on two tubes fabricated under this contract are given and their performance is compared to the theoretical limit. Recommendations for possible future work are made. Author (GRA)

N74-30592# Ohio State Univ., Columbus. ElectroScience Lab.
REFERENCE LOOP PHASE SHIFT IN ADAPTIVE ARRAYS Final Report
D. M. DiCarlo and R. T. Compton, Jr. May 1974 36 p refs
(Contract N00019-73-C-0195)
(AD-780232; ESL-3576-4) Avail: NTIS CSCL 09/5

The report discusses adaptive arrays in which the reference signal is derived from the array output. A particular problem is studied, the problem of reference loop phase shift. It is shown that phase shift in the reference loop causes the array weights to cycle, and also causes the array to frequency modulate the signal. In spite of this frequency change, the array maintains a maximum SNR at the output. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-30593# Erlangen-Nuremberg Univ. (West Germany).
ON THE FREQUENCY MULTIPLICATION ALONG SCHOTTKY TRANSMISSION CONTACTS Ph.D. Thesis [UEBER DIE FREQUENZVERVIELFACHUNG LAENGS SCHOTTKY KONTAKT LEITUNGEN]
Werner Rabus 1973 139 p refs In GERMAN
Avail: NTIS HC $10.00

The propagation of electromagnetic waves alongside nonlinear Schottky contacts and the frequency amplification along such transmission lines are studied. A small signal Schottky contact circuit model is used to calculate the appearance of shock waves as a function of transmission data capacity, preamplification capacity, semiconducting substrate losses, and ohm losses in the transmission band. Experimental studies with evaporated aluminum films on silicon single crystal wafers confirm analytical results. Transl. by G.G.

N74-30594# Texas Univ., Austin. Electronics Research Center.
A TIME RESOLVED DRIFT TUBE STUDY OF ELECTRON AVALANCHES IN OXYGEN
Robert J. Corbin, Donald W. Goodson, and Lothar Frommhold 10 Sep. 1973 126 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-778834; TR-152; AFOSR-74-0713TR) Avail: NTIS CSCL 07/4

In order to investigate pre-breakdown electron avalanches initiated in uniform fields in a high purity gas, a bakeable time resolved drift tube capable of operating near breakdown was constructed. The results of an investigation of electronic and ionic reactions in oxygen at pressures of 4, 8, 16, and 32 torr are reported as a function of E/p (ratio of electric field strength to pressure). The electron avalanches are started by photoelectrons.

The electrons are known to undergo both ionization and dissociative attachment. It is also known that the atomic O(-) thus formed may further undergo detachment, charge transfer, or three body ion conversion. O2(-), O3(-), and O4(-) were also observed. In order to generate computed pulse shapes, continuity equations for the densities of the various charge carriers in the reactions were integrated and the solutions programmed. Results in oxygen gave new measurements of Townsend's first ionization coefficient, the attachment, detachment, and total loss reaction rates attributed to atomic O(-) as well as confirming measurements of the detachment and effective attachment reaction rates attributed to O2(-) and O3(-). (Modified author abstract) GRA

N74-30595# Transportation Systems Center, Cambridge, Mass.
PROGRAM PLAN FOR SEARCH AND RESCUE ELECTRONICS ALTERING AND LOCATING SYSTEM Final Report, Jan. - Jun. 1973
C. Mundo, L. Tami, and G. Larson Feb. 1974 102 p refs
(PB-229998/0; DOT-TSC-OST-73-42) Avail: NTIS HC $4.50 CSCL 06G

Requirements are studied for electronic devices for altering and locating distress incidents. Data are provided that bound the problem. Possible alternatives are examined and compared. As a result, the GRAN-DILS concept is selected upon the basis of cost/benefits. A plan for acquiring the GRAN-DILS system is provided. Recommendations are made for the interim period prior to GRAN-DILS availability. GRA

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-30596 Ohio State Univ., Columbus.
STATION POSITION DETERMINATION FROM CORRELATED SATELLITE OBSERVATIONS IN THE NGS/DOD (BC-4) WORLDWIDE NETWORK Ph.D. Thesis
James Patrick Reilly 1974 184 p
Avail: Univ. Microfilms Order No. 74-17800

The effect was studied of correlated observations on the recovery of ground station positions in the worldwide network of optical observing stations of the National Geodetic Survey. This network is composed of 49 observing stations, more or less evenly distributed throughout the world. A mathematical model developed by Krakiwsky and Pope was modified to handle the correlated observations. A computer program was developed to read the correlated data directly from magnetic tapes and output reduced normal equations on punched cards. If two ground stations were located closer together than the equivalent of the height of the satellite, the inclusion of measured lengths between the two stations is a must in order to determine accurately the positions of the stations. Dissert. Abstr.

N74-30597* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPARATUS FOR APPLYING SIMULATOR g-FORCES TO AN ARM OF AN AIRCRAFT SIMULATOR PILOT Patent
Billy R. Ashworth and John T. Merrill, IV, inventors (to NASA) Issued 23 Jul. 1974 4 p Filed 9 Jun. 1972 Supersedes N72-27271 (10 - 18, p 2407)
(NASA-Case-LAR-10550-1; US-Patent-3,824,707; US-Patent-Appl-SN-261183; US-Patent-Class-35-12E) Avail: US Patent Office CSCL 14B

A device to be used with an aircraft simulator to apply positive and negative g forces to the pilot's arm is described. An arm harness fits around the arm which the pilot uses to operate the throttle. The device allows the harness to track intentional arm movements without exerting any restraining forces, and at the same time, applies g forces to to the pilots arm which are recorded by the aircraft simulator computer.
Official Gazette of the U.S. Patent Office

N74-30598*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CVT/GPL PHASE 2 INTEGRATED TESTING
Robert E. Shurney, George Maybee (Teledyne-Brown Eng. Co.), and Stan Schmitt (Teledyne-Brown Eng. Co.) 5 Apr. 1974 59 p ref
(NASA-TM-X-64861) Avail: NTIS HC $3.75 CSCL 14B

Emperiments representing earth observations, space physics, and material sciences disciplines were installed in the General Purpose Laboratory (GPL). The experiments and the GPL are described. The experiments interfaces the GPL and GPL support systems are assessed. The experiments were cloud physics, ionospheric disturbances, material sciences, high energy astronomy, and superfluid helium. Author

N74-30599*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB NEUTRAL BUOYANCY SIMULATOR
Aug. 1974 172 p Prepared by McDonnell-Douglas Astronautics Co., St. Louis
(Contract NAS9-6555)
(NASA-TM-X-64844) Avail: NTIS HC $5.00 CSCL 14B

The use of a neutral buoyancy simulator for developing extravehicular activity systems and for training astronauts in weightless activities is discussed. The construction of the facility and the operations are described. The types of tests and the training activities conducted in the simulator are reported. Photographs of the components of the simulator and actual training excerises are included. Author

N74-30600*# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Mobility and Environmental Systems Lab.
PERFORMANCE EVALUATION OF A SECOND-GENERATION ELASTIC LOOP MOBILITY SYSTEM Final Report
K.-J. Melzer and G. D. Swanson Jun. 1974 94 p refs
(NASA-CR-139531; M-74-7) Avail: NTIS HC $7.75 CSCL 13F

Tests were conducted to evaluate the mobility performance of a second-generation Elastic Loop Mobility System (ELMS II). Performance on level test lanes and slopes of Lunar Soil Simulant (LSS) and obstacle-surmounting and crevasse-crossing capabilities were investigated. In addition, internal losses and contact pressure distributions were evaluated. To evaluate the soft-soil performance, two basic soil conditions were tested: loose (LSS1) and dense (LSS5). These conditions embrace the spectrum of soil strengths tested during recent studies for NASA related to the mobility performance of the LRV. Data indicated that for the tested range of the various performance parameters, performance was independent of unit load (contact pressure) and ELMS II drum angular velocity, but was influenced by soil strength and ELMS pitch mode. Power requirements were smaller at a given system output for dense soil than for loose soil. The total system output in terms of pull developed or slope-climbing capability was larger for the ELMS II operating in restrained-pitch mode than in free-pitch mode. Author

N74-30601# Edgerton, Germeshausen and Grier, Inc., Albuquerque, N.Mex.
EMP SIMULATORS FOR MISSILES AND AIRPLANES
M. K. Bumgardner, M. A. Dreger, J. C. Giles, and G. F. Ross 4 Feb. 1974 190 p
(Contract N60921-73-C-0033)
(AD-780236; EG/G-AL-1026) Avail: NTIS CSCL 14/2

The manual is intended as a guide to EMP (electromagnetic pulse) Simulator selection. Descriptions of EMP Simulators were collected from a large number of documents and up-dated. Detailed technical discussions of 16 operating simulators are given along with cost and schedule information. Cost estimates for the construction of various types of simulators are also provided. Technical and financial information is summarized in table form for quick reference. A general discussion of the EM criterion pulse and EMP simulation is included as an aid for evaluating simulator performance. Author (GRA)

N74-30602# Naval Civil Engineering Lab., Port Hueneme, Calif.
A STRUCTURAL EVALUATION OF RAPID METHODS OF BACKFILLING FOR BOMB DAMAGE REPAIR Final Report, Jul. 1971 - Apr. 1973
James B. Forrest and T. A. Shugar Mar. 1974 94 p refs
(AF Proj. 683M)
(AD-780104; AFWL-TR-73-29) Avail: NTIS CSCL 01/5

The effectiveness of using conventional materials and procedures for backfilling and repairing bomb craters in airfield pavements is evaluated. Candidate backfill systems were analyzed by a finite element computer program with an automatic mesh generation capability. A nonlinear axisymmetric analysis predicts the stresses, strains, and deformations in the repaired crater, which are induced by simulated static aircraft wheel forces. Field tests were also conducted in which scaled models of craters were excavated and backfilled with well-graded and uniformly graded aggregates, densely and loosely placed. Each repaired crater was tested without a capping and with a 6-inch-thick concrete capping under a simulated F-4 wheel load. It was found that coarse, uniformly graded backfill with a capping equivalent in stiffness to 6 inches of portland cement concrete meets the requirements for rapidly repairing bomb craters. If possible, the aggregate should be discharged into the crater from a height of about 5 feet. Author (GRA)

N74-30603# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
LITERATURE SURVEY OF TIRE-ROAD EXPERIMENTS
James F. Sinnamon Feb. 1974 144 p refs
(PB-229893/3; UM-HSRI-PF-74-5) Avail: NTIS HC $4.75 CSCL 13F

The literature survey is restricted to publications which report the results of tests performed with real tires on actual road surfaces. The objective of the survey was to identify and summarize a compact source of reference materials believed to contain most of the current knowledge derived from on-the-road testing of automobile and aircraft tires. To this end, 38 references are individually summarized in a standard format outlining goal of tests, equipment used, road surfaces, tires tested, test procedure, techniques for analyzing and presenting data, and conclusions. A summary of the survey is presented. GRA

N74-30604# Austin Research Engineers, Inc., Tex.
CONTINUOUSLY REINFORCED CONCRETE AIRFIELD PAVEMENT. VOLUME 1: TESTS ON EXISTING PAVEMENTS AND SYNTHESIS OF DESIGN METHODS Final Report, Feb. 1972 - Dec. 1973
Harvey J. Treybig, B. Frank McCullough, and W. Ronald Hudson May 1974 213 p refs Sponsored in part by Army Engineer Waterways Experiment Station
(Contracts F29601-72-C-0057; DOT-FA71WAI-218; AF Proj. 683M)
(AD-780511; AFWL-TR-73-229-Vol-1; FAA-RD-74-33-1) Avail: NTIS CSCL 01/5

The report contains support documentation of design methods for continuously reinforced concrete pavements, both overlays and new construction. The experimental investigations of continuously reinforced concrete airfield pavements conducted as part of this research are described and analyzed. The field studies provide experimental validation of the design procedure. The report includes the general outline and analysis for design procedure for both overlay and new pavement. It includes a discussion of material evaluation requirements, handling of aircraft traffic projections for use in fatigue design, and the development of a fatigue curve. The report includes construction recommendations and suggestions based on the current state of knowledge and experience. A comparison is presented of the analyses and observations made on the pavements investigated in the field study. (Modified author abstract) GRA

N74-30605# Austin Research Engineers, Inc., Tex.
CONTINUOUSLY REINFORCED CONCRETE AIRFIELD PAVEMENT. VOLUME 2: DESIGN MANUAL FOR CONTINUOUSLY REINFORCED CONCRETE OVERLAY PAVEMENTS Final Report, Feb. 1972 - Dec. 1973
Harvey J. Treybig, B. Frank McCullough, and W. Ronald Hudson May 1974 87 p refs Sponsored in part by Army Engineer Waterways Experiment Station
(Contract F29601-72-C-0057; DOT-FA71WAI-218; AF Proj. 683M)
(AD-779953; AFWL-TR-73-229-Vol-2; FAA-RD-74-33-2) Avail: NTIS CSCL 01/5

The report constitutes Volume 2 of a four-volume series on design and construction of new and overlay continuously reinforced concrete airfield pavement, and contains a detailed procedure for designing overlay pavements. It contains procedures for evaluating the existing pavement and the materials composing the pavement, selecting the required overlay thickness, designing the transverse and longitudinal reinforcing steel and designing the joints. The design procedures are presented in the form of a series of charts and nomographs from which design parameters may be obtained by entering with appropriate input parameters. A detailed procedure for resilient modulus testing is also provided. Author (GRA)

N74-30606# Austin Research Engineers, Inc., Tex.
CONTINUOUSLY REINFORCED CONCRETE AIRFIELD PAVEMENT. VOLUME 3: DESIGN MANUAL FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT Final Report, Feb. 1972 - Dec. 1973
Harvey J. Treybig, B. Frank McCullough, and W. Ronald Hudson May 1974 96 p refs Sponsored in part by Army Engineer Waterways Experiment Station
(Contracts F29601-72-C-0057; DOT-FA71WAI-218; AF Proj. 683M)
(AD-780512; AFWL-TR-73-229-Vol-3; FAA-RD-74-33-3) Avail: NTIS CSCL 01/5

The report constitutes Volume 3 of a four-volume series on design and construction of new and overlay continuously reinforced concrete airfield pavement and contains a detailed procedure for designing new pavements. It contains procedures for evaluating values, selecting the required slab thickness, designing transverse and longitudinal reinforcing steel, joint design and designing anchorage systems. The design procedures are presented in the form of a series of charts and nomographs from which design parameters may be obtained by entering with appropriate input parameters. A detailed procedure for resilient modulus testing is also provided. Author (GRA)

N74-30607# Austin Research Engineers, Inc., Tex.
CONTINUOUSLY REINFORCED CONCRETE AIRFIELD PAVEMENT. VOLUME 4: GUIDE SPECIFICATION Final Report, Feb. 1972 - Dec. 1973
Harvey J. Treybig, B. Frank McCullough, and W. Ronald Hudson May 1974 40 p Sponsored in part by Army Engineer Waterways Experiment Station
(Contracts F29601-72-C-0057; DOT-FA71WAI-218; AF Proj. 683M)
(AD-780513; AFWL-TR-73-229-Vol-4; FAA-RD-74-33-4) Avail: NTIS CSCL 01/5

The report constitutes Volume 4 of a four-volume series on design and construction of new and overlay continuously reinforced concrete airfield pavement and contains guidance for construction fo these pavements. It contains recommendations for material requirements, construction requirements, equipment, concrete production and placement, steel placement, protection and curing, and field acceptance testing procedures and requirements. The general principles set forth are common to all types of concrete pavement construction but specific procedures and requirement are directed toward construction of pavements with continuous reinforcing steel. Author (GRA)

N74-30646 Geophysical Observatory, Sodankyla (Finland).
THE SODANKYLAE GEOPHYSICAL OBSERVATORY IN 1973
Eero Kataja *In* Suomalainen Tiedeakat. Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 23-58 (For availability see N74-30644 20-13)
(Rept-56/2) Copyright.

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-30608* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CENTRIFUGAL LYOPHOBIC SEPARATOR Patent
Franklin W. Booth and Robert A. Bruce, inventors (to NASA) Issued 13 Aug. 1974 8 p Filed 9 Aug. 1971 Supersedes N72-11293 (10 - 02, p 0187)
(NASA-Case-LAR-10194-1; US-Patent-3,828,524; US-Patent-Appl-SN-169962; US-Patent-Class-55-43; US-Patent-Class-55-159; US-Patent-Class-55-199) Avail: US Patent Office CSCL 20D

A centrifugal separator is described using a lyophobic filter for removing liquid particles from a mixed stream of gas and liquid under various negative or positive external acceleration conditions as well as zero g or weightless conditions. Rotating the lyophobic filter and inclining the filter to the entering flow improves the lyophobic properties of the filter, provides gross separation of larger liquid particles, and prevents prolonged contact of liquid droplets with the spinning filter which might change the filter properties or block the filter.
Official Gazette of the U.S. Patent Office

N74-30609 Colorado State Univ., Fort Collins.
THE STABILITY OF PARALLEL, QUASI-PARALLEL AND STATIONARY FLOWS Ph.D. Thesis
Rene Anthony Kahawita 1973 177 p
Avail: Univ. Microfilms Order No. 74-17537

The methods of linear perturbation theory have been used to study the stability of various flows, among them being: (1) the stability of boundary layers along concave heated walls; (2) the stability of boundary layers along concave walls with suction; (3) the stability of wall jets along concave and convex walls; (4) the spin up of a two dimensional cylinder in an infinite medium; (5) the stability of stationary layers of fluid with arbitrary temperature stratification, and the stability of natural convection flow along inclined plates. During the course of this work, three different solution techniques were employed; one of them was an approximate analytic technique, the remaining two were numerical. Three dimensional spatially and temporally amplifying disturbances were considered in this study. The results indicated that the normal velocity component of the mean flow in a boundary layer, although much smaller than the streamwise component had a profound effect in reducing the stability of the flow.
Dissert. Abstr.

N74-30610 California Univ., San Diego.
INTERMITTENCY OF THE FINE STRUCTURE OF TURBULENT VELOCITY AND TEMPERATURE FIELDS MEASURED AT HIGH REYNOLDS NUMBER Ph.D. Thesis
Paul John Masiello 1974 135 p
Avail: Univ. Microfilms Order No. 74-17709

An analysis of turbulent flow characteristics at high Reynolds numbers was conducted. The mathematical models used in analyzing the statistical distributions of the unaveraged and locally averaged quantities are presented. Measurements of velocity derivatives in the wind over the ocean waves were made with a hot wire anemometer. Temperature derivatives were measured using a 0.2 millimeter platinum cold wire with an a.c. bridge. Digital techniques were used to subtract the mean, square, and average of the data over varying numbers of consecutive samples.
Dissert. Abstr.

N74-30611 Connecticut Univ., Storrs.
THE RESPONSE OF A DEVELOPED TURBULENT BOUNDARY LAYER TO LOCAL TRANSVERSE SURFACE MOTION Ph.D. Thesis
Robert Parrow Lohmann 1974 288 p
Avail: Univ. Microfilms Order No. 74-16781

An experimental investigation was conducted to evaluate the characteristics of an initially axially flowing turbulent boundary layer that was forced to adjust to local transverse motion of the bounding wall. The results demonstrated that the transverse velocity boundary layer that develops as a result of the wall motion grows at a rate approximately proportional to the one-half power of distance from the surface discontinuity. In the region close to the wall, the transverse mean velocity distribution and wall shear stress component attain an asymptotic state in an axial distance of about ten initial boundary layer thickness. The imposition of a transverse strain rate on the initially axial boundary layer flow was found to cause substantial increases in the intensity of all three components of the turbulent motion and in the components of the Reynolds stress and lead to a strong coupling between the axial and transverse motion.
Dissert. Abstr.

N74-30612 North Carolina State Univ., Raleigh.
A NUMERICAL SOLUTION TO THE EXTERNAL DIFFUSION OF AN INCOMPRESSIBLE AXISYMMETRIC JET Ph.D. Thesis
Michael Hilton Jones 1973 60 p
Avail: Univ. Microfilms Order No. 74-19003

The external diffusion of an axisymmetric jet, such as would be generated by a ducted fan, is investigated numerically using the Marker-and-Cell technique for solving incompressible fluid flow problems. Solutions are included for many ratios of the jet velocity to the background or shroud velocity. Also, the boundaries of the diffusing jet are determined by numerically inserting fluid particles into the jet exhaust and tracing their respective trajectories. An IBM 370/165 computer was used to solve a set of finite difference analogies to the complete incompressible Navier Stokes equations, including all nonlinear terms. The only approximations are those arising from the finite difference representation. Results were plotted using the Calcomp plotter system. The results may be used as an aid in predicting ducted-fan performance with respect to thrust, operating efficiency, and noise.
Dissert. Abstr.

N74-30613 Florida Univ., Gainesville.
AN INVESTIGATION OF THE TURBULENT MIXING OF PARALLEL TWO-DIMENSIONAL COMPRESSIBLE DISSIMILAR GAS STREAMS Ph.D. Thesis
Seyfeddin Tanrikut 1973 217 p
Avail: Univ. Microfilms Order No. 74-19193

Turbulent mixing in the initial region of a half-jet composed of dissimilar gas streams was studied. An isoenergetic, nonreacting, and isobaric system with various velocity and mass flux ratios was studied both experimentally and theoretically. The flow problem was formulated as an initial value problem using the turbulent boundary layer equations in conjunction with phenomenological models for the turbulent eddy viscosity. These models consisted of Prandtl's mixing length hypothesis, Ferri's differential mass flux formulation, Schetz's extension of the Clauser integral model, and Alpinieri's momentum and mass flux model. The validity of the above models for the turbulent momentum transport mechanisms in the initial region of a half-jet was investigated on a consistent basis. The eddy diffusivity was obtained from the eddy viscosity model by considering the turbulent Schmidt number as a parameter.
Dissert. Abstr.

N74-30614 Florida Univ., Gainesville.
FREE MOLECULAR DRAG AND HEAT TRANSFER IN A DIFFUSELY REFLECTING RECTANGULAR CHANNEL AT ZERO ANGLE OF ATTACK Ph.D. Thesis
Aliuddin Ansari 1973 105 p
Avail: Univ. Microfilms Order No. 74-19120

The calculation of heat and momentum transfer and mass efflux for free molecular systems is discussed. The governing equations of flow are formulated for an arbitrary internal geometry and are applied to a rectangular channel at zero angle of attack. One of the dimensions of the channel perpendicular to the direction of macroscopic flow is assumed to be infinite. It is shown that the solution of the aerodynamic transport problem is premised on assumptions regarding the distribution function of the reflected flux. The simple model of diffusely reflected flux is used. In addition, a constant value of the energy accommodation coefficient is assumed. The incident number, energy, and momentum fluxes of ambient particles are evaluated in closed form using series representations for the relevant functions to evaluate the quadratures involved.
Dissert. Abstr.

N74-30615 Cornell Univ., New York.
HEAT INDUCED FLOW AND ITS APPLICATIONS Ph.D. Thesis
Neng Jong Yu 1974 177 p
Avail: Univ. Microfilms Order No. 74-17695

A theoretical study of fluid flows with energy input is presented. Three problems are investigated: (1) uniform flow with heat addition in various bounded regions; (2) unsteady cylindrical disturbances produced by a sudden energy release; (3) compressible boundary layer growth with volume heat addition inside the boundary layer. The first problem is steady two dimensional flows with simply shaped heated regions. The shock formation in a supersonic uniform flow with a rectangular region of heat addition is discussed. In the second part, the linear and nonlinear behavior of a cylindrical disturbance produced by a sudden energy release was studied. An example applying the study of cylindrical flow with heat addition to the focusing of a continuously operating laser is also presented. Finally, the effect of heat addition on the boundary layer growth of compressible, laminar, transitional and turbulent boundary layer flow over a given body was studied. Application of the results to the study of boundary layer growth along the nozzle wall of a gasdynamic laser was made. It is found that boundary layer separation can be prevented by proper design of the cavity region of the gasdynamic laser. Dissert. Abstr.

N74-30616 Virginia Polytechnic Inst. and State Univ., Blacksburg.
TURBULENT MIXING OF MULTIPLE, CO-AXIAL HELIUM JETS IN A SUPERSONIC AIRSTREAM Ph.D. Thesis
Azriel Karol G. Lorber 1974 101 p
Avail: Univ. Microfilms Order No. 74-18850

An empirical and analytical investigation of a strut-mounted, four-nozzle, downstream facing gaseous fuel injector assembly was conducted in a Mach 4 airstream with P sub zero = 154 psia and T sub zero = 520 R. Helium was used as the injectant, and the interjet spacing (S/D) was the main parameter varied. The principal data are in the form of helium concentration profiles at seven axial stations, Mach number distributions at three axial stations and Schlieren photographs of the flow field at different interjet spacings. An approximate analysis was developed based upon a linearization in the Von Mises plane, Crocco integrals for the temperature and concentrations fields and an eddy viscosity model. Good agreement with the data was achieved. It was found that, at these conditions, interjet spacing has an effect on mixing only up to S/D of approximately 2.5, with concentration of injectant becoming smaller as S/D is increased, and the Mach number downstream of the injector tends to decrease with decreasing S/D.
Dissert. Abstr.

N74-30617 Princeton Univ., N.J.
ON THE STABILITY OF FLOWS OF TWO DIMENSIONS Ph.D. Thesis
James Victor Tracy 1974 69 p
Avail: Univ. Microfilms Order No. 74-17496

The stability problem in the linear transition region is reformulated for two dimensional, incompressible flows. Particular attention is given to the development of a very general, yet properly formulated theory. The governing equations, resulting for this formulation, are analyzed systematically to develop usable criteria for the determination of admissible solutions. Numerical algorithms are employed to analyze particular test flow case, a planar wake flow. The theoretical results of the general theory are compared with the available experimental results measured in a corresponding wake flow. The agreement is considered to be excellent, thus confirming the fundamental viability of the theory. In addition, the limitations of previous formulations are established, and the interaction between the mean flow and the fluctuating flow is explicitly developed. Dissert. Abstr.

N74-30618 British Library Lending Div., Boston Spa (England).
ACOUSTIC DETECTION OF THE INCEPTION OF CAVITATION
J. H. Bunjes 28 Dec. 1973 44 p refs Transl. into ENGLISH from Netherlands Acoustic Soc. Report In ENGLISH and DUTCH
(BLL-NEL-TT-2527-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

A description is given of the development and application of an acoustic cavitation inception method for pumps and valves. Specifically, the method is used to quantify noise caused by caviation. Author

N74-30619 British Library Lending Div., Boston Spa (England).
THE ACOUSTIC METHOD FOR THE MEASUREMENT OF FLOW VELOCITIES
Fritz L. Brand 28 Dec. 1973 46 p refs Transl. into ENGLISH from the German In ENGLISH and GERMAN
(BLL-NEL-TT-2529-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

Various methods for the measurement of flow velocity in a fluid are discussed. Emphasis is placed on the use of acoustic waves for measuring the combined fluid flow and wave propagation rate. Mathematical models are presented to show the relationship of the factors involved. The instrumentation used to conduct the measurements is described. The advantages of certain methods are analyzed. The results obtained by the acoustic wave method are compared with those obtained by other methods. Author

N74-30620 Tennessee Univ., Knoxville.
ON THE INLET VORTEX SYSTEM Ph.D. Thesis
Norbert C. Bissinger 1974 152 p
Avail: Univ. Microfilms Order No. 74-17719

The inlet vortex which forms at certain flow conditions between a jet engine inlet and the ground is able to lift up pebbles and debris from the ground. Those particles which are sucked into the inlet very often damage the engine. Because none of the known methods to prevent the formation of the inlet vortex works under all practical conditions it was considered necessary to gather more knowledge about the formation of the inlet vortex and its surrounding flow field. Therefore, flow visualization tests have been conducted in a small watertunnel with the help of the hydrogen bubble method. With the help of a simple potential flow model it was possible to explain physically the inlet vortex system. The importance of the stagnation point at the inlet vortex foot for the vortex formation could be shown analytically. Dissert. Abstr.

N74-30621*# California Univ., Los Angeles. School of Engineering and Applied Science.
TRANSONIC CONICAL FLOW
Kaloust Gregory Agopian Feb. 1974 77 p refs Sponsored by NASA and ONR
(NASA-CR-139564; UCLA-ENG-7382) Avail: NTIS HC $7.00 CSCL 20D

The problem of inviscid, steady transonic conical flow, formulated in terms of the small disturbance theory, is studied. The small disturbance equation and similarity rules are presented, and a boundary value problem is formulated for the case of a supersonic freestream Mach number. The equation for the perturbation potential is solved numerically using an elliptic finite difference system. The difference equations are solved with a point relaxation algorithm that is also capable of capturing the shock wave during the iteration procedure by using the boundary conditions at the shock. Numerical calculations, for shock location, pressure distribution and drag coefficient, are presented for a family of nonlifting conical wings. The theory of slender wings is also presented and analytical results for pressure and drag coefficients are obtained. Author

N74-30622# Erlangen-Nuremberg Univ. (West Germany).
SINGLE PARTICLE MOTIONS IN NONSTEADY FLOW FIELD Ph.D. Thesis [BEWEGUNG EINZELNER PARTIKELN IM INSTATIONAEREN STROEMUNGSFELD]
Paul-Richard Schoeneborn 1973 121 p refs In GERMAN
Avail: NTIS HC $9.25

The motion of a sedimental spherical particle in a pulsating flow is analized by forming an approximative solution for the fall velocity decrease cause by nonlinear quasi-stationary flow resistance. A motion equation that encloses flow resistance can be used to determine the particle motion if vortice shedding of the sphere is not considered in the circulating flow field. This method adequately describes load effects on an oscillating sphere suspended in a fluid as well as the acceleration phase for a sedimentary sphere in a steady flow. Transl. by G.G.

N74-30623*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MODIFIED NEWTON-RAPHSON ANALYSIS OF FLIGHT MEASUREMENTS OF THE TRAILING VORTICES OF A HEAVY JET TRANSPORT
Lawrence W. Taylor, Jr. and Milton D. McLaughlin Washington Aug. 1974 72 p refs
(NASA-TN-D-7404; L-8838) Avail: NTIS HC $3.75 CSCL 01A

A modified Newton-Raphson method has been used to determine the parameters in equations describing the vortex flow to obtain a best match with flight measurements of the flow behind the C-5A airplane. The flight measurements were made using a specially instrumented T-33 airplane which passed as closely as possible to the centers of the trailing vortices at several distances behind the C-5A airplane. The flight measurements were transformed to flow velocity relative to an inertial frame of reference. The assumed form of the flow consisted of the superposition of two counterrotating, finite core vortices. The positions of the vortex centers, their total circulation, the effective eddy viscosity and measurement bias were the parameters adjusted. The assumed form of vortex flow fit well the measured velocities for the numerous sets of data, both flaps up and down for the C-5A airplane. The resulting values of total circulation, however, were about two-thirds that expected of a wing with an elloptical loading. A partial explanation of the less than expected circulation is a dip in the spanwise lift distribution at the airplane's center line. The distance between the trailing vortices at the smallest times encountered is somewhat less than that expected for an elliptical wing loading. Author

N74-30624*# Kanner (Leo) Associates, Redwood City, Calif.
EXTERNAL SOUND FIELD EFFECT ON A TURBULENT LAYER
P. Gougat Washington NASA Jul. 1974 96 p refs Transl. into ENGLISH of "Influence d'un Champ Acoustique Exterieur sur une Couche Limite Turbulente" CNRS, Meudon, France, Lab. d'Aerothermique, rept. 70-8, Sep. 1970 51 p
(Contract NASw-2481)
(NASA-TT-F-15852) Avail: NTIS HC $8.00 CSCL 20D

The response of a boundary layer to harmonic oscillations was analyzed in terms of the influence of an acoustic field on heat exchange in a turbulent boundary layer on a flat plate. Wind tunnel tests were performed using a hot-wire anemometer linked to a Wheatstone bridge. It is shown that an ultrasonic field is not appropriate and that, with the wind tunnel used, measurements were not possible for low frequencies. Author

N74-30625*# Michigan State Univ., East Lansing. Div. of Engineering Research.
THE USE OF DIGITAL TECHNIQUES TO EXAMINE THE INTERMITTENT REGION OF A TURBULENT JET
John F. Foss and Thomas E. Merrow 15 Aug. 1974 25 p refs
(Grant NGR-23-004-091)
(NASA-CR-139396) Avail: NTIS HC $4.25 CSCL 20D

Voltage signals, sampled at a high rate in the intermittent region of a round jet, are analyzed to provide instantaneous velocity vector information and measures of the vorticity and dissipation scales. A clustering routine to assess the feasibility of using the voltage readings to define the vortical, nonvortical state of the flow is also utilized. The results indicate that the clustering routine is partially successful; more sophisticated discrimination techniques will be required for a complete specification. Author

N74-30626*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ONE-DIMENSIONAL SHOCK WAVE FORMATION BY AN ACCELERATING PISTON Ph.D. Thesis - Ohio State Univ.
Michael John Mann 1970 164 p refs
(NASA-TM-X-70292) Avail: NTIS HC $11.25 CSCL 20D

The formation of a shock wave by a solid accelerating piston was studied. A theoretical solution using the method of characteristics for a perfect gas showed that a complex wave system exists, and that the compressed gas can have large gradients in temperature, density and entropy. Experiments were performed with a piston tube where piston speed, shock speed and pressure were measured. The comparison of theory and experiment was good. Author

N74-30627# Advisory Group for Aerospace Research and Development, Paris (France).
ANNULUS WALL BOUNDARY LAYERS IN TURBOMACHINES
J. H. Horlock (Cambridge Univ.) and H. J. Perkins (GE, Whetstone, Engl.) May 1974 69 p refs
(AGARD-AG-185; AGARDograph-185) Avail: NTIS HC $6.50

A study was conducted to determine the characteristics of annulus wall boundary layers in turbomachines. The subjects covered include the following (1) simple two-dimensional boundary layer calculation methods for analyzing flow characteristics, (2) the nature of cascade secondary flows, and (3) information on cascades, annular cascades, and compressors which provide the experimental input essential to the development of calculation methods. The study produced a method for predicting the full three-dimensional boundary layer that develops through a single blade row of a turbomachine. A computer program for the estimation of annulus blockage is listed. Author

N74-30628*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
QUANTIZED VORTICES AROUND WAVEFRONT NODES, 2
Joseph O. Hirschfelder, Charles J. Goebel, and Ludwig W. Bruch 19 Jul. 1974 12 p refs Sponsored by NASA
(NASA-CR-139530; WIS-TCI-515) Avail: NTIS HC $4.00 CSCL 20D

Quantized vortices can occur around nodal points in wavefunctions. The derivation depends only on the wavefunction being single valued, continuous, and having continuous first derivatives. Since the derivation does not depend upon the dynamical equations, the quantized vortices are expected to occur for many types of waves such as electromagnetic and acoustic. Such vortices have appeared in the calculations of the H + H2 molecular collisions and play a role in the chemical kinetics. In a companion paper, it is shown that quantized vortices occur when optical waves are internally reflected from the face of a prism or particle beams are reflected from potential energy barriers. Author

N74-30629*# Cornell Univ., Ithaca, N.Y.
IMPROVEMENTS TO EMBEDDED SHOCK WAVE CALCULATIONS FOR TRANSONIC FLOW-APPLICATIONS TO WAVE DRAG AND PRESSURE RISE PREDICTIONS Annual Progress Report
A. R. Seebass Aug. 1974 27 p refs
(Grant NGR-33-010-057)
(NASA-CR-139487) Avail: NTIS HC $4.50 CSCL 20D

The numerical solution of a single, mixed, nonlinear equation with prescribed boundary data is discussed. A second order numerical procedure for solving the nonlinear equation and a shock fitting scheme was developed to treat the discontinuities that appear in the solution. Author

N74-30630*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
AN EXPERIMENTAL INVESTIGATION OF THE FLOW FIELD FOR DOUBLE-WEDGE CONFIGURATIONS IN A MACH 4.97 STREAM
John J. Bertin and John C. Hinkle Jun. 1974 53 p refs
(Contract NAS9-13680)
(NASA-CR-134386; Rept-74003) Avail: NTIS HC $5.75 CSCL 20D

The viscous-inviscid interactions which perturb the flow around the wing leading edge are discussed. The flow field perturbation results when the fuselage-generated shock wave interacts with the wing-generated shock wave. Three types of shock interference patterns are possible for the wing leading edge of the orbiter. Author

N74-30631*# Old Dominion Univ. Research Foundation, Norfolk, Va. School of Engineering.
AN EXPERIMENTAL AND THEORETICAL STUDY OF THE FLOW PHENOMENA WITHIN A VORTEX SINK RATE SENSOR Final Technical Report
G. L. Goglia and D. K. Patel Jun. 1974 221 p refs

(Grant NGL-47-003-007)
(NASA-CR-139648; TR-74-T2) Avail: NTIS HC $14.00 CSCL 20D

Tests were conducted to obtain a description of the flow field within a vortex sink rate sensor and to observe the influence of viscous effects on its performance. The characteristics of the sensor are described. The method for conducting the test is reported. It was determined that for a specific mass flow rate and the geometry of the vortex chamber, the flow in the vortex chamber was only affected, locally, by the size of the sink tube diameter. Within the sink tube, all three velocity components were found to be higher for the small sink tube diameters. As the speed of rotation of the sensor was increased, the tangential velocities within the vortex chamber, as well as in the sink tube, increased in proportion to the speed of rotation. Author

N74-30632# Iowa Inst. of Hydraulic Research, Iowa City.
STUDY OF THICK BOUNDARY LAYER NEAR THE TAIL OF BODIES OF REVOLUTION Final Report
V. C. Patel 30 Sep. 1973 6 p refs
(Contract N00014-68-A-0196-0002)
(AD-780275; IIHR-150) Avail: NTIS CSCL 20/4

The research carried out under this contract can be divided into three main sections, namely (1) an experimental study of the thick, turbulent boundary-layer near the tail of a body of revolution, (2) methods of calculating the thick, axisymmetric, turbulent boundary-layer and its interaction with the potential flow, and (3) calculation of the viscous resistance of bodies of revolution at zero incidence. The progress made in each of these areas is reviewed. GRA

N74-30633# Minnesota Univ., Minneapolis.
MEASUREMENTS OF HELIUM 2 FLOW THROUGH SMALL PORES Ph.D. Thesis
B. B. Sabo Dec. 1973 113 p refs
(Contract AT(11-1)-1569)
(COO-1569-112) Avail: NTIS HC $7.75

The measurement of variations of average superfluid density of liquid helium in small pores of well-defined geometry is reported. In addition, the onset of dissipation of superfluid flow in these pores was investigated. The temperature range of the measurements was from 1.1 K to within 12 mK of the lambda point at 2.1632 K (at one atmosphere). Author (NSA)

N74-30634# Harry Diamond Labs., Washington, D.C.
FLUERICS 34: PLANAR-NOZZLE DISCHARGE COEFFICIENTS
Tadeusz M. Drzewiecki Sep. 1973 37 p refs
(DA Proj. 1T0-61102-A-33B)
(AD-779516; HDL-TM-72-33) Avail: NTIS CSCL 13/7

The report deals with the formulation of a general expression for calculating planar-nozzle discharge coefficients cd. The expression is in terms of constants whose values depend only on geometry and are directly calculable from a simple solution of the Karman-Pohlhausen momentum integral equations. The assumption of one-dimensional inviscid flow to determine the free-stream velocities and pressure distributions is shown to be valid by the good agreement with observation. Measured and theoretically determined discharge coefficients for nozzles of widths from 0.5 to 2.0 mm generally agree to within 4 percent. This is excellent in light of the fact that the normal experimental deviation is about 4%. The discharge coefficient cd remains virtually constant for turbulent flow. (Modified author abstract) GRA

N74-30635# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
DISCHARGE COEFFICIENTS AND INTERNAL FLOW FIELDS OF SMALL DRILLED THROAT NOZZLES USED IN FLUID AMPLIFIERS
John P. Leonard 15 Apr. 1974 130 p refs
(DA Proj. 1M3-62303-A-214)
(AD-779464; RG-74-21) Avail: NTIS CSCL 13/7

Discharge coefficient and related transonic flow field properties are examined for conical convergent divergent nozzles with small (.05 in.) drilled out throat section. Half angles are 30 degrees for convergent section and 15 degrees for the divergent section. A sharp edge throat nozzle is used as a reference configuration. Air at ambient temperature and stagnation pressures from 50 to 1000 psia is the working medium. Measured discharge coefficient data is presented. Color schlieren images and results obtained from an axisymmetric transonic program are, also, presented. Transonic flow field phenomena are qualitatively compared with measured discharge data. Author (GRA)

N74-30636# Iowa Inst. of Hydraulic Research, Iowa City.
CALCULATION OF THE VISCOUS RESISTANCE OF BODIES OF REVOLUTION
A. Nakayama and V. C. Patel Oct. 1973 37 p refs
(Contract N00014-68-A-0196-0002)
(AD-780235; IIHR-151) Avail: NTIS CSCL 20/4

The flow in the tail region of a body of revolution is a complex one since there the boundary layer often grows to a thickness many times the local radius of the body and there results a strong interaction between the boundary layer and the external potential flow. The influence of making simplifying assumptions concerning the flow in this region in conventional drag-calculation methods is discussed, and assessed by incorporating a method which takes into account the effects of the thick axisymmetric boundary-layer near the tail in an approximate manner. It is shown that this modification leads to a drag-calculation method which gives consistently accurate prediction of the viscous resistance of a wide variety of bodies of revolution. Author (GRA)

N74-30637# Johns Hopkins Univ., Baltimore, Md.
THE INFLUENCE OF SHEAR ON MIXING ACROSS DENSITY INTERFACES
Robert R. Long Jun. 1974 33 p refs
(Contract N00014-67-A-0163-0013; NR Proj. 061-198)
(AD-780449; TR-4-Ser-C) Avail: NTIS CSCL 20/4

The paper discussed critically experimental observations of mixing processes across density interfaces in laboratory experiments and inferences that have been made and can be made from these observations. It is shown that the drag coefficient in flow of a stratified fluid over a rough surface is independent of the Richardson number (or density jump across the interface or inversion) and depends only on the ratio of the roughness length to the depth of the homogeneous layer. This has obvious implications for problems of parameterizing the momentum flux near the ground in the atmosphere. (Modified author abstract) GRA

N74-30638# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RESEARCH ON HEAT TRANSFER IN SPHERES AND THIN CONES IN THE HYPERSONIC FLOW OF A RAREFIED GAS
Yu. V. Nikolskii, G. E. Pervushin, and L. G. Chernikova 19 Apr. 1974 14 p refs Transl. into ENGLISH from UCH. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 1, 1970 p 71-77
(AF Proj. G101)
(AD-780377; FTD-HT-23-1977-74) Avail: NTIS CSCL 20/4

The research sheds light on heat transfer in spheres and thin cones at a zero angle of attack. The investigations were conducted in a vacuum wind tunnel at Mach numbers M = 4.9-9.5, and Reynold numbers Re0 = 35-1 for spheres, and Re0 = 100-4 for cones; this corresponds to the transition range between free-molecular flow and the flow of a continuous medium. The procedure used was the measurement of the total heat flow under standard conditions with compensation of heat losses in a sting, and an independent measurement of the radiant heat flux. A comparison of the data with the results of the theoretical calculation was made. GRA

N74-30639# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL INVESTIGATION OF A TURBULENT BOUNDARY LAYER ON A GREATLY ELONGATED BODY OF REVOLUTION IN A SUPERSONIC FLOW
V. M. Kovalenko, N. I. Nesterovich, and V. M. Shulemovich 24 May 1974 12 p Transl. into ENGLISH from Izv. Sib. Otd. Akad. Nauk SSSR, Ser. Tekh. Nauk (USSR), No. 8, 1972 p 41-46
(AF Proj. G101)

(AD-780337; FTD-HT-23-1280-74) Avail: NTIS CSCL 19/7

An experimental investigation was made of tranverse curvature effects on the integral characteristics of a turbulent boundary layer. Special attention was given to friction drag and total pressure distribution. Author (GRA)

N74-30640# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

HYPERSONIC FLOW AROUND A SOLID OF REVOLUTION ON WHICH A FANNED JET IS INJECTED

M. I. Lerman 30 Apr. 1974 14 p refs Transl. into ENGLISH from Vestn. Leningrad. Univ., Ser. Mat., Mekh. Astron. (USSR), no. 2, Apr. 1972 p 96-101

(AD-780317; FTD-HT-23-715-74) Avail: NTIS CSCL 21/5

Hypersonic gas flow around a solid of revolution with zero angle of attack was investigated. The problem consisted of determining the shape of the jet in the carrier flow, gas parameters in the jet, shapes of shock waves near the solid of revolution on which the fanned is injected, and gas parameters under the shock wave. Estimates were made of the penetration depth of the fanned jet into the carrier flow and the shape of the shock wave near the solid of revolution on which the fanned jet is injected. Author

N74-30641# Naval Ship Research and Development Center, Bethesda, Md.

LINEAR DESIGN OF SUPERCAVITATING CASCADE SECTIONS

Bohyun Yim and Laurie Higgins Mar. 1974 43 p refs (SF43421704)

(AD-780228; NSRDC-4239) Avail: NTIS CSCL 20/4

A method for designing two-dimensional supercavitating cascade sections is developed. Linear superposition is used to produce a foil section that has a low drag-to-lift ratio and yet has a reasonably thick cavity. Foils of three elementary pressure distributions are analyzed separately, i.e., a low drag-pressure distribution, a concentrated leading-edge pressure, and a flat plate with angle of attack. The double spiral vortex model is taken for the cavity termination. The pressure distributions are superposed to give the desired lift and cavity thickness for any specified cavity length and cascade geometry. The cavity drag, the cavitation number, and the foil-cavity shape are the main output of the computer program. Cascade parameters are shown to strongly influence the previously mentioned quantities as well as the leading-edge shape. Author (GRA)

N74-30642# Technion Research and Development Foundation, Ltd., Haifa (Israel). Dept. of Aeronautical Engineering.

ON THE TWO DIMENSIONAL TURBULENT JET Interim Report

I. Wygnanski and E. Gutmark 1973 67 p refs (Grant AF-AFOSR-2346-73; AF Proj. 9871)

(AD-780124; TAE-201: AFOSR-74-0870TR) Avail: NTIS CSCL 20/4

Results from hot wire measurements in a plane incompressible jet are reported. The flow was found to be self preserving at distances greater than 40 diameters and measurements were made beyond 120 diameters. The quantities measured include mean velocities, turbulence intensities, third and fourth order terms, as well as two point correlations and intermittency. Conditional sampling techniques were used to obtain data exclusively with the turbulent zone of the jet. The results are compared with previous investigations. This is a third paper in a sequel which provides data on turbulent free shear flows. Author (GRA)

N74-30643# Tel-Aviv Univ. (Israel). School of Engineering.

ON TRANSITION IN A PIPE. PART 2: THE EQUILIBRIUM PUFF Final Report

I. Wygnanski, M. Sokolov, and D. Friedman 1974 52 p refs (Grant AF-AFOSR-2346-72; AF Proj. 9781)

(AD-780107; TAU-SOE-94/74; AFOSR-74-0868TR) Avail: NTIS CSCL 20/4

Conditionally sampled hot wire measurements were taken in a pipe at low Reynolds numbers between 2700 and 2000 corresponding to the onset of turbulence as a result of a large perturbation in the flow. This type of transition gives rise to a turbulent puff which maintains itself indefinitely around Re = 2200. The structure of the puff was investigated in some detail and was found to be very different from the structure of the fully developed turbulent pipe flow, nevertheless it is independent of the character to the disturbance which created it. The purpose of the study was to gain some insight into the mechanism of transition in a pipe. Author (GRA)

N74-31102 Joint Publications Research Service, Arlington, Va.

CRITICAL GRASSHOFF NUMBERS AS A FUNCTION OF THE ELONGATION OF A TWO-DIMENSIONAL BASIN HEATED FROM BELOW

V. V. Alekseyev and V. Ye. Belashchenko *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 77-89 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 54-63 (For availability see N74-31096 20-20)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-30644 Suomalainen Tiedeakatemia, Helsinki (Finland).

COLLECTED PAPERS TO COMMEMORATE THE 60TH ANNIVERSARY OF THE SODANKYLAE OBSERVATORY

J. Keraenen, ed. and C. Sucksdorff, ed. 1973 225 p refs In ENGLISH; partly in GERMAN

(ISBN-951-41-0106-5) Copyright. Avail: Issuing Activity

Research of the geophysical observatory at Sodankyla is described along with the international cooperation between Finland and Germany. For individual titles, see N74-30645 through N74-30650.

N74-30645 Suomalainen Tiedeakatemia, Helsinki (Finland).

ON THE DISTRIBUTION OF THE EARTH MAGNETIC FIELD IN SODANKYLAE [WEBER DIE VERTEILUNG DES ERDMAGNETISCHEN FELDES IN SODANKYLAE]

J. Keraenen *In its* Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 5-22 refs In GERMAN; ENGLISH summary (For availability see N74-30644 20-13)

(Rept-56/1) Copyright.

The results of magnetic surveys conducted to establish a magnetic observatory are reported. A suitable site 7 km south of Sodankyla was found. Author

N74-30646 Geophysical Observatory, Sodankyla (Finland).

THE SODANKYLAE GEOPHYSICAL OBSERVATORY IN 1973 c11

Eero Kataja *In* Suomalainen Tiedeakat. Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 23-58 (For availability see N74-30644 20-13)

(Rept-56/2) Copyright.

The article begins with a short history of the Sodankyla Observatory (1882-84), followed by a description of the new observatory, established in 1914. The work of the magnetic, ionospheric, seismological and astronomical stations is described. Author

N74-30647 Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany).

TWENTY YEARS OF COOPERATION IN IONOSPHERIC RESEARCH WITH FINLAND

W. Dieminger *In* Suomalainen Tiedeakat. Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 59-72 refs (For availability see N74-30644 20-13)

(Rept-56/3) Copyright.

The cooperation in ionospheric research between Germany and Finland is discussed. Topics discussed include: eclipse experiments, oblique incidence observations, VLF propagation, and observations of beacon satellites. Publications resulting from this cooperation are listed. F.O.S.

N74-30648 Department of Energy, Mines and Resources, Ottawa (Ontario).

THE SOLAR AND LUNAR DAILY GEOMAGNETIC VARIA-

TIONS AT SODANKYLAE, 1914 - 1966
Jagdish Chandra Gupta *In* Suomalainen Tiedeakat. Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 73-181 refs (For availability see N74-30644 20-13)
(Rept-56/4) Copyright.

The daily harmonic coefficients of the X, Y (obtained from H and D) and Z-components of the geomagnetic field variations at the station Sodankyla, Finland are computed for the period 1914 - 1966. These data are grouped in several ways according to annual mean relative-sunspot-number, daily international character figure, and the daily local character figure. Altogether 216 different groups of these 52 years data are formed, which include any particular set as a whole, y, and its three subdivisions into the Lloyd's seasons j, e and d. For each group, solar and lunar daily variations are obtained by computing harmonic coefficients by the Chapman-Miller method. The practical details of the method are briefly discussed. The data are also analyzed to study disturbance daily variation in different sunspot groups and the magnetic activity groups. The variations for many groups are illustrated by various tables, daygraphs, vectograms and the dialgrams. The annual, semiannual, seasonal, monthly, semi-monthly and diurnal variations are discussed in the light of the information available from other sources and analyses. Author

N74-30649 Geophysical Observatory, Sodankyla (Finland).
SOLAR-CYCLE VARIATION OF IONOSPHERIC F2-LAYER PROFILE PARAMETERS AT SODANKYLAE
Seppo Koivumaa *In* Suomalainen Tiedeakat. Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 183-201 refs (For availability see N74-30644 20-13)
(Rept-56/5) Copyright.

Correlations between basic F 2-layer profile parameters and long-term solar and magnetic activity are studied. The magnetic activity seems to cause hysteresis variations in profile parameters. In most cases their shape is in accordance with the known effects of magnetic activity in the ionosphere. Yearly amplitudes also have a solar cycle variation. The varying effects of magnetic activity in different seasons has no linear dependence on solar flux. Author

N74-30650 Geophysical Observatory, Sodankyla (Finland).
BIBLIOGRAPHY OF THE GEOPHYSICAL OBSERVATORIES AT SODANKYLAE
Hilkka Ranta and Eero Kataja *In* Suomalainen Tiedeakat. Collected Papers to Commemorate the 60th Anniv. of the Sodankylae Obs. 1973 p 203-233 refs (For availability see N74-30644 20-13)
(Rept-56/6) Copyright.

A list of papers are presented concerning the activities of the geophysical observatories at Sodankyla, Finland, the temporary First Polar Year station in 1882 and the Geophysical Observatory of the Finnish Academy of Science and Letters since 1913. The papers are grouped under five headings: general activities at Sodankyla Observatory, geomagnetism, aeronomy, seismology, and meteorology. In addition, a list of data series is included. Author

N74-30651 Minnesota Univ., Minneapolis.
A STUDY OF THE AURORAL SUBSTORM BY SOUNDING ROCKET Ph.D. Thesis
Paul Marvin Kinter, Jr. 1974 146 p
Avail: Univ. Microfilms Order No. 74-17258

The auroral substorm, as a large scale event associated with plasma changes deep in the magnetosphere was probed with an instrument sounding rocket. The experiment was designed to detect electric fields and currents in the ionosphere. A paradigmatic motivation was established for anticipating the flow of currents in the ionosphere including magnetic field-aligned currents. The payload experiments included an electric field meter, a vector magnetometer, and a Langmuir probe. Their design and construction is discussed as well as critical design parameters in the ionosphere. A model reproducing the payload dynamic was developed from onboard aspect measurements. A current model was also developed whose magnetic field reproduced the observed magnetic field. It was found that during an auroral substorm, a Hall current flows westward, while in the same region, a southward Pederson current flows. Dissert. Abstr.

N74-30652 Florida Univ., Gainesville.
A STUDY OF SOME CURRENT PROBLEMS IN TERRESTRIAL IONOSPHERIC BEHAVIOR Ph.D. Thesis
Dennis Richard Furman 1973 250 p
Avail: Univ. Microfilms Order No. 74-19145

A high time resolution study of loss and transport in the F region was conducted, and electron density data were analyzed to obtain the vertical transport velocity virtually free from neutral model errors. Recent suggestions that the observed values of the solar EUV flux should be doubled were considered by comparing electron production and loss, using ion composition and density data, with the observed and calculated electron flux. The effect of gravity waves on ionospheric temperature and composition was also investigated. Perturbations in temperature are shown to have negligible effect on reaction rates in the lower F region, while those in the ion composition may be significant. A time dependent study of a model aurora comprised the final phase of inquiry into current problems in terrestrial ionospheric behavior. Continuity and heat balance equations for a number of ions, neutrals, and temperatures were solved simultaneously. Dissert. Abstr.

N74-30653 Cornell Univ., Ithaca, N.Y.
RADAR STUDIES OF SMALL-SCALE PLASMA IRREGULARITIES IN THE EQUATORIAL ELECTROJET Ph.D. Thesis
Bela Gyula Fejer 1974 202 p
Avail: Univ. Microfilms Order No. 74-18091

Small scale density irregularities in the equatorial electrojet are studied using highly improved radar techniques. It is shown that the Type 2 irregularities are definitely due to the gradient drift instability. Observations of backscattered power versus height show a significant difference between the daytime and nightime. During daytime the profile shows a single peak at about 104 km and echoes are observed between 93 km and 113 km, while at night the power profiles are strongly layered and echoes are observed up to about 130 km. Spectral observations with excellent height and time resolution indicate a significant height variation of the phase velocity of the unstable waves. Oblique Type 1 irregularities are only observed in the upper portion of the electrojet backscattering region (above about 105 km). Spectra from vertically propagating waves indicate a strongly turbulent electrojet medium. Counter-electrojet effects are observed during both magnetically quiet and disturbed periods. Dissert. Abstr.

N74-30654 Texas Univ., Dallas.
SILICATE MINERAL CHEMISTRY OF SELECTED APOLLO 15, 16 AND 17 SOILS Ph.D. Thesis
Henry Clyde Taylor 1973 285 p
Avail: Univ. Microfilms Order No. 74-18749

The utilization of small amounts of material in the mineralogical and chemical characterization of lunar soil samples appears to be very successful in formulating major geological deductions. Such knowledge should be valuable in the planning of future extraterrestrial scientific missions. Mineral analyses of pyroxenes, olivines and plagioclases from the less than 1 millimeter fraction of some Apollo 15, 16 and 17 soil samples can be used to distinguish mare, KREEP and ANT or highland basalt components in these soils. Comparison of mineral chemistry in soils 15501 and 15411 from the Apennine Front/Hadley Rille area allow characterization of the 15501 soil collected near Hadley Rille as consisting primarily of mare-basalt components, whereas the 15411 soil, collected at Spur Crater on the Hadley Delta front, consists primarily of gabbroic-anorthosite components. Dissert. Abstr.

N74-30655 Oregon State Univ., Corvallis.
HIGH FREQUENCY TEMPERATURE AND VELOCITY FLUCTUATIONS IN THE ATMOSPHERIC BOUNDARY LAYER Ph.D. Thesis
Richard Melton Williams 1974 88 p
Avail: Univ. Microfilms Order No. 74-18286

Turbulent temperature and velocity fluctuations in air were measured over an open field during the summer at a height of 2 meters. Emphasis was placed on precisely determining the high frequency region of the spectra of these fluctuations, including the dissipation range. The velocity fluctuations were measured with a commercially available hot-wire anemometer,

with a wire diameter of 3.7 microns and length approximately 1 mm. The temperature fluctuation measurements were made with a platinum resistance thermometer which consisted of a platinum wire of 0.5 micron diameter and about 1 mm in length. The temperature measuring system was developed as part of the research. Dissert. Abstr.

N74-30656 British Library Lending Div., Boston Spa (England).
COMB OVER THE ARCTIC
V. Molchanov [1974] 3 p Transl. into ENGLISH from Pravda (USSR), 31 Oct. 1973
(BLL-M-23263-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Preparations for the launching of instrumented air balloons are reported. These flying laboratories will observe electron and proton fluxes during aurora borealis flashes over the Arctic.
G.G.

N74-30657 British Library Lending Div., Boston Spa (England).
TECHNOLOGICAL PROGRESS AND PROTECTION OF THE BIOSPHERE
A. Vinogradov [1974] 13 p Transl. into ENGLISH from Kommunist (USSR), no. 11, 1973
(BLL-M-23206-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The problem of man's interaction with the natural sphere is increasingly stirring world public opinion. The effect of rapidly developing modern production and technology on the biosphere is growing with every year. To avert the threat of the ecological crisis the efforts of separate countries to protect nature are obviously inadequate. In this field it is essential to establish effective cooperation of all states. Constructive steps directed at organizing the protection of the biosphere on a global scale are advocated. Author

N74-30658 British Library Lending Div., Boston Spa (England).
ON STUDYING AND FORECASTING THE EXTREME STAGES IN THE DEVELOPMENT OF ATMOSPHERIC CIRCULATION
A. A. Girs [1974] 38 p refs Transl. into ENGLISH from Arkt. Antarkt. Nauch.-Issled. Inst. (USSR), no. 313, 1972 p 119-140
(BLL-M-23281-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Long range forecasting of extremes in meteorological conditions are discussed for the polar areas of the Northern Hemisphere. Climatological data from 1891 to 1966 were examined, and types of atmospheric pressure and temperature anomaly distribution, which were observed linked to types of atmospheric circulation patterns. F.O.S.

N74-30659 British Library Lending Div., Boston Spa (England).
MATHEMATICS LOOKS INTO THE EARTH
[1974] 5 p Transl. into ENGLISH from Izvestiya (Moscow), 19 Sep. 1973
(BLL-M-23228-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The content of an interview is presented which concerns the uses of mathematical and computer techniques in oil and gas prospecting. The method is discussed in terms of prediction analysis whereby geological features and data on interior structures of the earth are correlated in an effort to forecast favorable locations for undiscovered mineral deposits. Ongoing activities in geological forecasting are briefly described for Western Siberia. A.A.D.

N74-30660 British Library Lending Div., Boston Spa (England).
TURBULENT BALLOON JOURNEY IN A LOW LEVEL JET STREAM
B. Beck [1971] 31 p refs Transl. into ENGLISH from Schweiz., Met. Zentr., Arbeitsberichte, no. 25, 1971 In ENGLISH and GERMAN
(BLL-M-23211-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl: 3 BLL photocopy coupons

Jet streams occurring in the lower troposphere can prove dangerous for various types of aircraft, as the balloon flights of 1/11/70 demonstrate. The flight reports for this data identify and describe a Low Level Jet stream (LLJ). LLJ's occur quite rarely over Central Europe and are connected with specific synoptic conditions (cyclonic west wind) and favorable geographical relief (foothills of the Bavarian Alps). Author

N74-30661 British Library Lending Div., Boston Spa (England).
THE UTILIZATION OF THE KOLMOGOROV-GABOR FORECAST FILTER FOR PROGNOSTICATION OF HYDRO-METEOROLOGICAL FEATURES
V. M. Zvereva, V. P. Kules, and Ju. N. Sergeev [1972] 12 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., Ser. Geol. i Geogr. (Leningrad), v. 2, no. 12, 1972 p 147-151 In ENGLISH and RUSSIAN
(BLL-M-23302-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Study of the possibilities and details of applying adaptive forecast filters for the solution of oceanological problems contributes towards the broadening and consolidation of the arsenal of methods for forecasting hydrometeorological phenomena. A promising method is the linear extrapolation of stationary stochastic processes that includes nonlinear terms in the formula. Author

N74-30662 British Library Lending Div., Boston Spa (England).
SUB-ANNUAL FREQUENCY OF FORMS OF ATMOSPHERIC CIRCULATION AND THE FLUCTUATION IN MEAN MONTHLY PRESSURE WITH THE PHASES OF THE 22-YEAR CYCLE
V. A. Beljazo [1972] 31 p refs Transl. into ENGLISH from Tr. Arkt. Antarkt. Nauchn.-Issled. Inst. (Leningrad), v. 313, 1972 p 209-224 In ENGLISH and RUSSIAN
(BLL-M-23209-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Research findings regarding the existence of a 22 year cycle in solar activity are reviewed in preface to a discussion of the binary cycle (corresponding 11 year cycles) and its relation to atmospheric circulation and mean monthly characteristics of the barometric field. Data on the mean monthly frequency of observed forms of circulation were employed, including charts of mean monthly pressure anomalies for the month of October, 1891 through 1960. A series of general regularities in seasonal variation emerged from analysis of the data which were determined to be related to the rising and falling of the 11 year even phase, and the 11 year odd phase, of the 22 year cycle. Recorded data are shown in demonstration of the evidence that inverse variation occurs in each corresponding phase of the odd and even cycles, and that solar activity does, in fact, influence certain atmospheric processes. A.A.D.

N74-30663*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
PRELIMINARY S-193 RADSCAT OCEANOGRAPHIC DATA FOR SKYLAB 2
Willard J. Pierson, Jr., Richard K. Moore, Principal Investigators, Arun Sobti, and James Young Feb. 1974 31 p refs EREP (Contract NAS9-13642)
(E74-10525; NASA-CR-138274; CRES-TM-254-3) Avail: NTIS HC $4.75 CSCL 08C

There are no author-identified significant results in this report.

N74-30664*# Stanford Univ., Calif. Remote Sensing Lab.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, 1-30 Apr. 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 30 Apr. 1974 3 p EREP
(Contract NAS9-13357)
(E74-10658; NASA-CR-138890; MR-9) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-30665*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Jun. 1974
Richard F. Nalepka and William A. Malila, Principal Investigators 23 Jul. 1974 6 p EREP

(Contract NAS9-13280)
(E74-10667; NASA-CR-138997; ERIM-101900-34-L; MPR-16) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-30666*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Jun. 1974
Joe R. Eagleman, Principal Investigator, Wen Lin, and Larry League Jun. 1974 13 p refs EREP
(Contract NAS9-13273)
(E74-10671; NASA-CR-139237) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-30667*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Plans and Progress Report, 1 Apr. - 31 Jul. 1974
Charles E. Poulton, Principal Investigator 31 Jul. 1974 3 p EREP
(Contract NAS9-13286)
(E74-10674; NASA-CR-138840) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-30668*# Texas A&M Univ., College Station. Remote Sensing Center.
MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION Progress Report, 28 Mar. - 27 May 1974
J. W. Rouse, Jr., Principal Investigator 27 May 1974 8 p ERTS
(Contract NAS5-21857)
(E74-10676; NASA-CR-139243; PR-7) Avail: NTIS HC $4.00 CSCL 08F

The author has identified the following significant results. From the data that have been analyzed thus far, it is apparent that certain parameters of the vegetation (green biomass and vegetation moisture content) are well correlated with ERTS data at some sites, yet the relationship is poor at other locations. The analyses indicate that the green wave development (spring) can be readily detected in the Great Plains Corridor. Consequently, ERTS-1 data provide a new tool for monitoring range readiness on a regional basis. The onset of summer drought and its duration can also be monitored. Data from ten G.P.C. sites suggest that the satellite coverage has been adequate to monitor the status of rangeland vegetation for regional management purposes.

N74-30669*# Geological Survey, Reston, Va. Geographic Applications Program.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, May 1974
Robert Alexander, Principal Investigator and Harry F. Lins, Jr. 20 May 1974 3 p EREP
(NASA Order T-5290-B)
(E74-10677; NASA-CR-139244) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-30670*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[BLACK AND WHITE INFRARED IMAGERY AROUND LAKE MONROE, INDIANA] Monthly Report, Jul. 1974
LeRoy Silva, Principal Investigator Jul. 1974 2 p EREP
(Contract NAS9-13301)
(E74-10678; NASA-CR-139274) Avail: NTIS HC $4.00 CSCL 14E

There are no author-identified significant results in this report.

N74-30671*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Jun. 1974
Irvin J. Sattinger, Principal Investigator 1 Aug. 1974 2 p EREP
(Contract NAS9-13283)
(E74-10679; NASA-CR-139241; ERIM-103300-29-L) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-30672*# Stanford Univ., Calif.
PHOTOGEOLOGIC ANALYSIS OF ERTS-1 IMAGERY, NORTHERN CALIFORNIA
Ernest I. Rich, Principal Investigator [1974] 13 p refs Original contains imagery. Orginal photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21775)
(E74-10680; NASA-CR-139245) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-30673*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA Final Report, 18 Sep. 1972 - 28 Feb. 1974
William A. Deutschman, Principal Investigator Apr. 1974 32 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21858)
(E74-10681; NASA-CR-139246) Avail: NTIS HC $4.75 CSCL 05B

There are no author-identified significant results in this report.

N74-30674*# Minnesota State Planning Agency, St. Paul.
APPLICATION OF ERTS-1 IMAGERY TO STATE WIDE LAND INFORMATION SYSTEM IN MINNESOTA Progress Report, Jan. - Jun. 1974
Joseph Sizer, John R. Borchert, Principal Investigators, Dwight A. Brown, Merle P. Meyer, Richard Rust, Richard H. Skaggs, Joseph Ulliman, Joseph C. Gibson, Eliahu Stern, John Harrington et al Jul. 1974 11 p Prepared in cooperation with Minnesota Univ., Minneapolis ERTS
(Contract NAS5-21801)
(E74-10682; NASA-CR-139247) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-30675*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Sciences.
GEOLOGICAL LANDFORM ANALYSIS IN THE CENTRAL PIEDMONT OF VIRGINIA AND NORTH CAROLINA Final Report, 1 Feb. - 16 Jul. 1974
Lynn Glover, III, Principal Investigator 16 Jul. 1974 21 p refs ERTS
(Contract NAS5-21729)
(E74-10683; NASA-CR-139235) Avail: NTIS HC $4.25 CSCL 08G

There are no author-identified significant results in this report.

N74-30676*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Jul. 1974
Joe R. Eagleman, Principal Investigator, Norman Hardy, and Surendra Parashar Jul. 1974 17 p refs EREP
(Contract NAS9-13273)
(E74-10684; NASA-CR-139251) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-30677*# Sheffield Univ. (England). Dept. of Geography.
AN EVALUATION OF EREP (SKYLAB) AND ERTS IMAGERY FOR INTEGRATED NATURAL RESOURCES SURVEY
J. L. VanGenderen, Principal Investigator Sep. 1973 25 p refs Sponsored by NASA EREP
(E74-10685; NASA-CR-139252) Avail: NTIS HC $4.25 CSCL 05B

The author has identified the following significant results. An experimental procedure has been devised and is being tested for natural resource surveys to cope with the problems of interpreting and processing the large quantities of data provided by Skylab and ERTS. Some basic aspects of orbital imagery such as scale, the role of repetitive coverage, and types of sensors are being examined in relation to integrated surveys of natural resources and regional development planning. Extrapolation away from known ground conditions, a fundamental technique for mapping resources, becomes very effective when used on orbital imagery supported by field mapping. Meaningful boundary delimitations can be made on orbital images using various image enhancement techniques. To meet the needs of many developing countries, this investigation into the use of satellite imagery for integrated resource surveys involves the analysis of the images by means of standard visual photointerpretation methods.

N74-30678*# Sheffield Univ. (England). Dept. of Geography.
STEREO STUDY AS AN AID TO VISUAL ANALYSIS OF ERTS AND SKYLAB IMAGES
J. L. VanGenderen, Principal Investigator Oct. 1973 11 p refs Sponsored by NASA EREP
(E74-10686; NASA-CR-139253) Avail: NTIS HC $4.00 CSCL 05B

The author has identified the following significant results. The parallax on ERTS and Skylab images is sufficiently large for exploitation by human photointerpreters. The ability to view the imagery stereoscopically reduces the signal-to-noise ratio. Stereoscopic examination of orbital data can contribute to studies of spatial, spectral, and temporal variations on the imagery. The combination of true stereo parallax, plus shadow parallax offer many possibilities to human interpreters for making meaningful analyses of orbital imagery.

N74-30679*# Itek Corp., Lexington, Mass. Optical Systems Div.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Final Report
Nicholas Gramenopoulos, Principal Investigator Jul. 1974 100 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21766)
(E74-10688; NASA-CR-139221) Avail: NTIS HC $8.00 CSCL 08B

The author has identified the following significant results. A diffraction pattern analysis of MSS images led to the development of spatial signatures for farm land, urban areas and mountains. Four spatial features are employed to describe the spatial characteristics of image cells in the digital data. Three spectral features are combined with the spatial features to form a seven dimensional vector describing each cell. Then, the classification of the feature vectors is accomplished by using the maximum likelihood criterion. It was determined that the recognition accuracy with the maximum likelihood criterion depends on the statistics of the feature vectors. It was also determined that for a given geographic area the statistics of the classes remain invariable for a period of a month, but vary substantially between seasons. Three ERTS-1 images from the Phoenix, Arizona area were processed, and recognition rates between 85% and 100% were obtained for the terrain classes of desert, farms, mountains, and urban areas. To eliminate the need for training data, a new clustering algorithm has been developed. Seven ERTS-1 images from four test sites have been processed through the clustering algorithm, and high recognition rates have been achieved for all terrain classes.

N74-30680*# Stanford Univ., Calif. Remote Sensing Lab.
MULTISPECTRAL SIGNATURES IN RELATION TO GROUND CONTROL SIGNATURE USING NESTED SAMPLING APPROACH Progress Report, 3 May - 3 Jul. 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 3 Jul. 1974 5 p ERTS
(Contract NAS5-21884)
(E74-10690; NASA-CR-139223) Avail: NTIS HC $4.00 CSCL 05B

The author has identified the following significant results. In a cooperative study with USGS personnel, it has been possible to detect a 1.5 by 1 mile anomaly on ERTS CCT data, in the pine-covered mountains of western Nevada. This anomalous area is about 3-5 times larger than that of the known geobotanical anomaly which lies centrally within the area. The site has been studied on the ground and bi-directional reflectances, relative to BaSO4 obtained for 40 trees, using both in-vivo techniques (similar to cherry picker operations) and field determinations of cut branches. The anomaly can be seen best by color transparencies made from 5/4, 6/4, 7/4 ratioed digital data, the 3 ratios each being coded by one of 3 colors (blue, green, and red).

N74-30681*# American Univ., Washington, D.C. Dept. of Biology.
SKYLAB - EREP INVESTIGATIONS OF WETLANDS ECOLOGY Bimonthly Progress Report, 6 Jun. - 6 Aug. 1974
Richard R. Anderson, Virginia P. Carter, Principal Investigators, and Linda J. Alsid 6 Aug. 1974 4 p EREP
(Contract NAS1-12209)
(E74-10691; NASA-CR-139224; BMPR-8) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-30682*# Army Engineer District, San Francisco, Calif. Geoscience Div.
CALIFORNIA COAST NEARSHORE PROCESSES STUDY Final Report, Aug. 1972 - May 1974
Douglas M. Pirie and David D. Steller, Principal Investigators May 1974 168 p refs Prepared in cooperation with Geosource Intern., Inc. Original contains color illustrations. Original contains color imagery. Orginal photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70257-AG)
(E74-10692; NASA-CR-139225) Avail: NTIS HC $11.50 CSCL 08C

There are no author-identified significant results in this report.

N74-30683*# Geological Survey, Denver, Colo.
A SYNTHESIS OF SAND SEAS THROUGHOUT THE WORLD Final Report, 1 Jul. 1972 - 31 Mar. 1974
Edwin D. McKee, Carol S. Breed, Principal Investigators, Steven Fryberger, Dana Gebel, and Camilla McCauley 1 Apr. 1974 95 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-4)
(E74-10693; NASA-CR-139226) Avail: NTIS HC $7.75 CSCL 08M

There are no author-identified significant results in this report.

N74-30684*# Boeing Co., Kent, Wash. 04a
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Jun. - Jul. 1974
David L. Tingey, Principal Investigator Jul. 1974 1 p EREP (Contract NAS9-13303)
(E74-10694; NASA-CR-139227) Avail: NTIS HC $4.00

There are no author-identified significant results in this report.

N74-30685*# Construction Engineering Research Lab., Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF

RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 9 Jun. - 8 Aug. 1974
Ravinder Jain, K., Principal Investigator 8 Aug. 1974 1 p ERTS
(NASA Order S-70255-AG)
(E74-10695; NASA-CR-139228) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-30686*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Jun. 1974
Allan Shapiro, Principal Investigator 8 Aug. 1974 1 p EREP
(NASA Order T-4716-B)
(E74-10697; NASA-CR-139316) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-30687*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193 Monthly Letter Progress Report No. 11, Jul. 1974
Richard K. Moore, Fawwaz T. Ulaby, Principal Investigators, Arun Sobti, John C. Barr, Evan Davison, Chia Sung, Saad Ulaby, and Tom Burton Jul. 1974 23 p EREP
(Contract NAS9-13331)
(E74-10698; NASA-CR-139317) Avail: NTIS HC $4.25 CSCL 05B

There are no author-identified significant results in this report.

N74-30688*# Maine Dept. of Transportation, Augusta.
MULTIDISCIPLINARY ANALYSIS FOR HIGHWAY ENGINEERING PURPOSES Progress Report
Ernest G. Stoeckeler, Raymond G. Woodman, and Robert S. Farrell, Principal Investigators 6 Aug. 1974 9 p EREP
(Contract NAS9-13359)
(E74-10699; NASA-CR-139318; PR-3) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-30689*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Jul. - 31 Jul. 1974
A. G. Mourad, D. M. J. Fubara, Principal Investigators, and M. B. Kuhner 15 Aug. 1974 7 p EREP
(Contract NAS9-13276)
(E74-10700; NASA-CR-139320; PR-17) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-30690*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Jul. 1974
Jack G. Quade, Principal Investigator Jul. 1974 2 p EREP
(Contract NAS9-13274)
(E74-10701; NASA-CR-139321) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-30691*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Jul. 1974
Paul M. Merifield, Principal Investigator 5 Aug. 1974 2 p EREP
(Contract NAS2-7698)
(E74-10702; NASA-CR-139322; MPR-14) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-30692*# Iowa State Univ. of Science and Technology, Ames. Agriculture Experiment Station.
REMOTE SENSING IN IOWA AGRICULTURE: IDENTIFICATION AND CLASSIFICATION OF IOWA'S CROPS, SOILS AND FORESTRY RESOURCES USING ERTS-1 AND COMPLIMENTARY UNDERFLIGHT IMAGERY Final Report, period ending May 1974
J. P. Mahlstede, Principal Investigator, A. Epstein, R. E. Carlson, T. E. Fenton, and G. W. Thomson 28 May 1974 71 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21839)
(E74-10703; NASA-CR-139323) Avail: NTIS HC $6.75 CSCL 02C

There are no author-identified significant results in this report.

N74-30693*# Eason Oil Co., Oklahoma City, Okla.
AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION Final Report, Jan. 1973 - Jan. 1974
Robert J. Collins, Principal Investigator, Frederic P. McCown, Leo P. Stonis, Gerald J. Petzel, and John R. Everett Jun. 1974 157 p refs Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21735)
(E74-10704; NASA-CR-139433) Avail: NTIS HC $11.00 CSCL 08G

The author has identified the following significant results. ERTS-1 data give exploration geologists a new perspective for looking at the earth. The data are excellent for interpreting regional lithologic and structural relationships and quickly directing attention to areas of greatest exploration interest. Information derived from ERTS data useful for petroleum exploration include: linear features, general lithologic distribution, identitifcation of various anomalous features, some details of structures controlling hydrocarbon accumulation, overall structural relationships, and the regional context of the exploration province. Many anomalies (particularly geomorphic anomalies) correlate with known features of petroleum exploration interest. Linears interpreted from the imagery that were checked in the field correlate with fractures. Bands 5 and 7 and color composite imagery acquired during the periods of maximum and minimum vegetation vigor are best for geologic interpretation. Preliminary analysis indicates that use of ERTS imagery can substantially reduce the cost of petroleum exploration in relatively unexplored areas.

N74-30694# Ludwig-Maximilians-Universitat, Munich (West Germany).
MEASUREMENTS OF EARTH MAGNETIC FIELD ALONG PROFILES IN THE BEGINNING NORTHERN ALPS AND IN THE ALPINE MOUNTAINS (DELTA Z, DELTA T), 1964 - 1973 [VERMESSUNG DES ERDMAGNETISCHEN FELDES LAENGS PROFILEN IM NOERDLICHEN ALPENVORLAND UND IN DEN ALPEN (DELTA Z, DELTA T), 1964 - 1973]
1974 44 p refs In GERMAN
Avail: NTIS HC $5.25

Geomagnetic anomalies are mapped according to intensity and dimensions and some geomorphological models are stipulated for deep rock formations. For individual titles, see N74-30695 through N74-30698.

N74-30695 Ludwig-Maximilians-Universitat, Munich (West Germany).
MEASUREMENT TECHNIQUE, VARIABLE REDUCTION AND NORMAL FIELD [MESSTECHNIK, VARIATIONSREDUKTION UND NORMALFELD]
K. Wienert *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 3-5 refs In GERMAN (For availability see N74-30694 20-13)

Geomagnetic field measurement techniques with torsion magnetometers, proton magnetometers and zero balance magnetometers are described probable error sources are considered and their normalizations are outlined. Transl. by G.G.

N74-30696 Ludwig-Maximilians-Universitat, Munich (West Germany).
GROUND MEASUREMENTS AND INTERPRETATION OF TWO Z ANOMALIES IN THE EARTH MAGNETIC FIELD NEAR INGOLSTADT AND VOHBURG ON THE DONAU [BODENVERMESSUNG UND INTERPRETATION ZWEIER Z-ANOMALIEN DES ERDMAGNETFELDES BEI INGOLSTADT UND VOHBURG AN DER DONAU]
G. Schoenharting *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 7-10 refs In GERMAN (For availability see N74-30694 20-13)

Analyses of seismic reflections and gravimetric measurements on two magnetic anomalies indicate crystalline formations at depths of about 420 to 500 m. Magnetization parameters and the shape of the inclusions point to amphilbolitic or gabbro-like basic formations; it is assumed that these are subvolcanic structures. Transl. by G.G.

N74-30697 Ludwig-Maximilians-Universitat, Munich (West Germany).
TOTAL AND VERTICAL-INTENSITY MEASUREMENTS ALONG AN ALPINE CROSS PROFILE AT THE NORTHERN PART OF THE GEODETICAL TRAVERSE 1a. PROFILE 11: SALZBURG, PASS LUEG, ST. JOHANN, HUETTSCHLAG [VERMESSUNG DER TOTALINTENSITAET UND VERTIKALINTENSITAET LAENGS EINES ALPENQUERPROFILES AUF DEM NOERDLICHEN ABSCHNITT DER GEOTRAVERSE 1A. PROFIL 11: SALZBURG, PASS LUEG, ST. JOHANN, HUETTSCHLAG]
U. Bleil *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 11-14 refs In GERMAN (For availability see N74-30694 20-13)

Evaluation of geological and geophysical measurements on the intensity of the geomagnetic anomaly in the vicinity of Berchtesgaden on the northern leg of the geotraverse 1a establishes a regional positive anomaly with intensities Delta T up to 150 gamma at a median width of about 40 km. Median fluctuations are + or - 10 gamma, maximal fluctuations + or - 50 gamma. Transl. by G.G.

N74-30698 Ludwig-Maximilians-Universitat, Munich (West Germany).
ANOMALIES OF THE VERTICAL Z COMPONENT IN THE EARTH MAGNETIC FIELD OF THE BEGINNING NORTHERN ALPS AND IN THE EASTERN ALPS, MEASURED ALONG THE PROFILES 1965-1973 (PROFILE SYNOPSIS) [ANOMALIEN DER VERTIKALEN KOMPONENTE Z DES ERDMAGNETFELDES IM NOERDLICHEN ALPEN-VORLAND UND IN DEN OSTALPEN, GEMESSEN LAENGS PROFILEN 1958-1973 (PROFILMONTAGE)]
G. Angenheister *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 15-36 refs In GERMAN (For availability see N74-30694 20-13)

Precise geomagnetic anomaly measurements for the Berchesgadan area are presented in maps, and various geomorphological models for the earth crust structure are used to interpret variations in magnetic values. Transl. by G.G.

N74-30699# Tohoku Univ., Sendai (Japan).
THE SCIENCE REPORTS OF THE TOHOKU UNIVERSITY. SERIES 5: GEOPHYSICS, VOLUME 21, NO. 3
Sep. 1973 34 p refs
Avail: NTIS HC $4.75

Geomagnetic surveys of volcanoes and twilight observations of D lines are reported. For individual titles, see N74-30700 through N74-30701.

N74-30700 Tohoku Univ., Sendai (Japan). Dept. of Earth Science.
RESULTS OF AEROMAGNETIC SURVEYS OVER SOME VOLCANOES AND CALDERAS IN JAPAN
Isao Muroi *In* Tohoku Univ. Sci. Rept. Ser. 5: Geophys Vol. 21, No. 3 Sep. 1973 p 87-111 refs (For availability see N74-30699 20-13)

Aeromagnetic surveys of the total intensity over Oshima and Hakone volcanoes, and Towada and Onikobe calderas in Japan were carried out at different flight levels by using a proton precession magnetometer mounted on a helicopter, in order to study their magnetic structures. The magnetic anomaly to be measured at each height depends on the magnetic contrast of the underground structure. The rate at which the anomaly varies with the flight level is affected by the shape of the structure. From the vertical gradient of the total magnetic anomaly, the depth and shape of the structure have been determined. In Oshima, the anomaly is considerable and the structures are very complicated with several dipole models, the depth ranging from 800 m to 4 km. In Hakone, the anomaly due to the Old Somma lava is obvious. 'Kintokiyama - Maku-yama' dislocation line is made clear. Two prism-shaped models as the assumed structure for Mt. Kamiyama are considered at 0.5 and 1.0 km in depth. In the Towada district, a large low anomaly over the northeastern shore of the Lake Towada and two anomalies over Yasumiya south of the Lake were observed. The former is assumed to be a dipole with a reversed magnetization situated at 4 km in depth. In Onikobe, a caldera-like feature is shown, though the magnetic anomaly is not so considerable as the areas mentioned above. Author

N74-30701 Tohoku Univ., Sendai (Japan). Upper Atmosphere and Space Research Lab.
TWILIGHT OBSERVATION OF THE SODIUM LAYER
Hiroshi Kamiyama, Shoichi Okano, Toshihiro Ohnuma, and Toshiro Ichikawa *In* Its Sci. Rept. Ser 5: Geophys., Vol. 21, No. 3 Sep. 1973 p 114-120 refs (For availability see N74-30699 20-13)

Observations of the sodium D lines in twilightglow were made at Mt. Zao Observatory with a scanning spectrometer. The observed brightness as a function of the solar depression angle are compared with theoretical curves calculated with assuming various models of the sodium layer. This procedure leads to a conclusion of the most probable parameters characterizing the actual sodium layer. In fall, 1972, the maximum of the sodium density appeared usually in the region between 90 and 95 km, and the average of total vertical sodium abundance was found to be 5.5 x 10 to the 9th power atoms sq cm. Author

N74-30702# Technische Universitaet, Munich (West Germany).
OBSERVATIONAL RESULTS FOR 1973 OBTAINED AT THE GEOMAGNETIC OBSERVATORY FUERSTENFELDBRUCK [ERGEBNISSE DER BEOBACHTUNGEN AM ERDMAGNETISCHEN OBSERVATORIUM FUERSTENFELDBRUCK IM JAHRE 1973]
1974 62 p refs In GERMAN
Avail: NTIS HC $6.25

Fluxgate-variometric geophysical measurements for 1973 are presented in tables and graphs. The data include declination, horizontal intensity, vertical intensity and photo-optical registrations of geomagnetic pulsations. Transl. by G.G.

N74-30703# RAND Corp., Santa Monica, Calif.
RELATION BETWEEN AIR-SEA EXCHANGE OVER THE ARABIAN SEA AND THE FLUCTUATIONS OF THE WESTERN INDIA SUMMER MONSOON
Chandrakant M. Bhumralkar Apr. 1974 65 p refs
(Grant NSF GA-368)
(P-5210) Avail: NTIS HC $6.25

Observations made by research aircraft, during the summer of 1963, were used to determine the thermal structure and the modifications of the summer monsoon air mass over the Arabian Sea. Five-day running averages of the conventional daily marine meteorological data, over the Arabian Sea, were computed for the period June 20 through July 19, 1963. These averages, centered at the middle date of each 5-day period, were substituted in the transfer equations to compute quasi-synoptic scale daily transfer of latent heat and sensible heat between the Arabian Sea and the atmosphere. The patterns of latent heat transfer and its transport along the surface 4-day trajectories were considered in relation to the fluctuations of the intensity of

precipitation at the west coast of India. When the rain-producing system to the north of the Arabian Sea intensifies, the surface winds over the Arabian Sea strengthen and cause greater evaporation of moisture into the system, thereby further intensifying the rainfall at the west coast of India. When the supply of moisture to the system (from the Bay of Bengal) is cut off, its intensity decreases. The surface winds over the Arabian Sea decrease in speed and thus the supply of moisture to the system is reduced still further which hastens the decay of the system and break in monsoon rain occurs. Author

N74-30704*# Techtran Corp., Glen Burnie, Md.
CERTAIN ASPECTS OF THE PROBLEM OF REDUCING THE FORCE OF GRAVITY
S. V. Yevseyev Washington NASA Jul. 1974 11 p refs Transl. into ENGLISH from Geofiz. Sb. (USSR), v. 55, 1973 p 3-8
(Contract NASw-2485)
(NASA-TT-F-15839) Avail: NTIS HC $4.00 CSCL 08E

The Faye-Putnam reduction formula was deduced on the basis of the established relation between anomalies and regional topography, and again by Taylor's series expansion. Author

N74-30705*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THIRD EARTH RESOURCES TECHNOLOGY SATELLITE-1 SYMPOSIUM. VOLUME 1: TECHNICAL PRESENTATIONS, SECTION A
Stanley C. Freden, comp., Enrico P. Mercanti, comp., and Margaret A. Becker, comp. Washington 1974 992 p refs Symp. held at Washington, D. C., 10-14 Dec. 1973
(NASA-SP-351-Vol-1-Sect-A) Avail: NTIS MF $1.45; SOD HC $16.80 per set of sections A and B CSCL 05B

Papers presented at the Third Symposium on Significant Results Obtained from the first Earth Resources Technology Satellite covered the areas of: agriculture, forestry, range resources, land use, mapping, mineral resources, geological structure, landform surveys, water resources, marine resources, environment surveys, and interpretation techniques. For individual titles, see N74-30706 through N74-30773.

N74-30706* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ERTS-1 SYSTEM PERFORMANCE OVERVIEW
John H. Boeckel *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 1-12 (For availability see N74-30705 20-13)
CSCL 22C

The ERTS-1 spacecraft had a life of one year as a design goal. At the end of one year, the spacecraft was still providing about 130 scenes per day in multispectral images having resolution and radiometric accuracy better than prelaunch predictions. Author

N74-30707* Canadian Center for Remote Sensing, Ottawa (Ontario).
CANADIAN ERTS PROGRAM PROGRESS REPORT
L. W. Morley and A. K. McQuillan *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 13-19 refs (For availability see N74-30705 20-13)
CSCL 05B

Progress of the Canadian ERTS program is provided along with statistics on the production and role of ERTS images both from the CCRS in Ottawa and from the Prince Albert Saskatchewan satellite station. The types of products, difficulties of production and some of the main applications in Canada are discussed. Author

N74-30708* Kansas Univ., Lawrence. Dept. of Geography.
ESTIMATE OF WINTER WHEAT YIELD FROM ERTS-1
Stanley A. Morain and Donald W. Williams *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 21-28 refs (For availability see N74-30705 20-13)
(Paper-A1) CSCL 02C

A model for estimating wheat yield per acre has been applied to acreage estimates derived from ERTS-1 imagery to project the 1973 wheat yields for a ten county area in southwest Kansas. The results (41.04 million bushels) are within 3 per cent of the preharvest estimates for the same area prepared by the USDA Statistical Reporting Service (39.91 million bushels). The projection from ERTS data is based on a visual enumeration of all detectable wheat fields in the study area and was completed while the harvest was in progress. Visual identification of winter wheat is readily achieved by using a temporal sequence of images (band 5 for Sept.-Oct.; band 5 for Dec.-Jan.; and band 5 and 7 for March-April). Identification can be improved by stratifying the project area into subregions having more or less homogeneous agricultural practices and crop mixes. By doing this, small changes in the spectral appearance of wheat related to soil type, irrigation, etc. can be accounted for. The interpretation rules developed by visual analysis can be automated for rapid computer surveys. Author

N74-30709* Canadian Center for Remote Sensing, Ottawa (Ontario).
USER ORIENTED ERTS-1 IMAGES c14
Seymour Shlien and David Goodenough *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 29-40 refs (For availability see N74-30705 20-13)
(Paper-A2) CSCL 14B

Photographic reproduction of ERTS-1 images are capable of displaying only a portion of the total information available from the multispectral scanner. Methods are being developed to generate ERTS-1 images oriented towards special users such as agriculturists, foresters, and hydrologists by applying image enhancement techniques and interactive statistical classification schemes. Spatial boundaries and linear features can be emphasized and delineated using simple filters. Linear and nonlinear transformations can be applied to the spectral data to emphasize certain ground information. An automatic classification scheme was developed to identify particular ground cover classes such as fallow, grain, rape seed or various vegetation covers. The scheme applies the maximum likelihood decision rule to the spectral information and classifies the ERTS-1 image on a pixel by pixel basis. Preliminary results indicate that the classifier has limited success in distinguishing crops, but is well adapted for identifying different types of vegetation. Author

N74-30710* Purdue Univ., Lafayette, Ind.
AN EVALUATION OF MACHINE PROCESSING TECHNIQUES OF ERTS-1 DATA FOR USER APPLICATIONS c08
David Landgrebe *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 41-73 refs (For availability see N74-30705 20-13)
(Contract NAS5-21773; Grant NGL-15-005-112)
(Paper-A3) CSCL 09B

A broad study is described to evaluate a set of machine analysis and processing techniques applied to ERTS-1 data. Based on the analysis results in urban land use analysis and soil association mapping together with previously reported results in general earth surface feature identification and crop species classification, a profile of general applicability of this procedure is beginning to emerge. Put in the hands of a user who knows well the information needed from the data and also is familiar with the region to be analyzed it appears that significantly useful information can be generated by these methods. When supported by preprocessing techniques such as the geometric correction and temporal registration capabilities, final products readily useable by user agencies appear possible. In parallel with application, through further research, there is much potential for further development of these techniques both with regard to providing higher performance and in new situations not yet studied. Author

N74-30711* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE UTILITY OF ERTS-1 DATA FOR APPLICATIONS IN AGRICULTURE AND FORESTRY
R. Bryan Erb *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 75-85 (For availability see N74-30705 20-13)
(Paper-A4) CSCL 02F

A comprehensive study has been undertaken to determine the extent to which ERTS-1 data could be used to detect, identify (classify), locate and measure features of applications interest in the disciplines of agriculture and forestry. The study areas included: six counties in five states in which were located examples

of the most important crops and practices of American agriculture; and a portion of the Sam Houston National Forest, a typical Gulf coastal plain pine forest. The investigation utilized conventional image interpretation and computer-aided (spectral pattern recognition) analysis using both image products and computer compatible tapes. The emphasis was generally upon the computer-aided techniques. It was concluded that ERTS-1 data can be used to detect, identify, locate and measure a wide array of features of interest in agriculture and forestry. Author

N74-30712* Department of Agriculture, Washington, D.C. Statistical Reporting Service.
CROP IDENTIFICATION AND ACREAGE MEASUREMENT UTILIZING ERTS IMAGERY
William H. Wigton and Donald H. VonSteen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 87-92 (For availability see N74-30705 20-13)
(Paper-A5) CSCL 02C

The Statistical Reporting Service of the U.S. Department of Agriculture is evaluating ERTS-1 imagery as a potential tool for estimating crop acreage. A main data source for the estimates is obtained by enumerating small land parcels that have been randomly selected from the total U.S. land area. These small parcels are being used as ground observations in this investigation. The test sites are located in Missouri, Kansas, Idaho, and South Dakota. The major crops of interest are wheat, cotton, corn, soybeans, sugar beets, potatoes, oats, alfalfa, and grain sorghum. Some of the crops are unique to a given site while others are common in two or three states. This provides an opportunity to observe crops grown under different conditions. Results for the Missouri test site are presented. Results of temporal overlays, unequal prior probabilities, and sample classifiers are discussed. The amount of improvement that each technique contributes is shown in terms of overall performance. The results show that useful information for making crop acreage estimates can be obtained from ERTS-1 data. Author

N74-30713* Agricultural Research Service, Weslaco, Tex.
VEGETATION DENSITY AS DEDUCED FROM ERTS-1 MSS RESPONSE
C. L. Wiegand, H. W. Gausman, J. A. Cuellar, A. H. Gerbermann, and A. J. Richardson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 93-116 refs (For availability see N74-30705 20-13)
(Paper-A6) CSCL 08F

Reflectance from vegetation increases with increasing vegetation density in the 0.75- to 1.35 micron wavelength interval. Therefore, ERTS-1 bands 6 (0.7 to 0.8 micron) and 7 (0.8 to 1.1 micron) contain information that should relate to the probable yield of crops and the animal carrying capacity of rangeland. The results of an experiment designed specifically to test the relations among Leaf Area Index (LAI), plant population, plant cover and plant height, and the ERTS-1 MSS responses for 3 corn, 10 sorghum, and 10 cotton fields are given. Plant population was as useful as LAI for characterizing the sorghum and corn fields, and plant height was as good as LAI for characterizing cotton fields. These findings generally support the utility of ERTS-1 data for explaining variability in green biomass, harvestable forage and other indicators of productivity. Author

N74-30714* California Univ., Berkeley. Center for Remote Sensing Research.
REGIONAL AGRICULTURE SURVEYS USING ERTS-1 DATA
William C. Draeger, James D. Nichols, Andrew S. Benson, David G. Larrabee, William M. Jenkus, and Claire M. Hay *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 117-125 (For availability see N74-30705 20-13)
(Paper-A7) CSCL 02C

The Center for Remote Sensing Research has conducted studies designed to evaluate the potential application of ERTS data in performing agricultural inventories, and to develop efficient methods of data handling and analysis useful in the operational context for performing large area surveys. This work has resulted in the development of an integrated system utilizing both human and computer analysis of ground, aerial, and space imagery, which has been shown to be very efficient for regional crop acreage inventories. The technique involves: (1) the delineation of ERTS images into relatively homogeneous strata by human interpreters, (2) the point-by-point classification of the area within each strata on the basis of crop type using a human/machine interactive digital image processing system; and (3) a multistage sampling procedure for the collection of supporting aerial and ground data used in the adjustment and verification of the classification results. Author

N74-30715* Canadian Forestry Service, Edmonton (Alberta).
FOREST AND LAND INVENTORY USING ERTS IMAGERY AND AERIAL PHOTOGRAPHY IN THE BOREAL FOREST REGION OF ALBERTA, CANADA
C. L. Kirby *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 127-136 (For availability see N74-30705 20-13)
(Paper-A8) CSCL 02F

Satellite imagery and small-scale (1:120,000) infrared ektachrome aerial photography for the development of improved forest and land inventory techniques in the boreal forest region are presented to demonstrate spectral signatures and their application. The forest is predominately mixed, stands of white spruce and poplar, with some pure stands of black spruce, pine and large areas of poorly drained land with peat and sedge type muskegs. This work is part of coordinated program to evaluate ERTS imagery by the Canadian Forestry Service. Author

N74-30716* Forest Management Inst., Ottawa (Ontario).
SO2 DAMAGE TO FORESTS RECORDED BY ERTS-1
Peter A. Murtha *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 137-143 refs (For availability see N74-30705 20-13)
(Paper-A9) CSCL 02F

Sulfur dioxide fumes have been affecting the forests around Wawa, Ontario, which have been under surveillance for a number of years and were recently covered by ultra-small-scale (1:160,000) air photography for damage-assessment purposes. Image interpretation supported by electronic color enhancement was used to delineate on ERTS imagery three damage zones (total-kill, heavy-kill and medium-damage zones). The zones delineated on ERTS imagery are similar to the results of aerial sketch-mapping and air photo interpretation. Band 5 provided the greatest detail for assessing the damage to the forests, followed in successive order by bands 4, 6 and 7. Comparison with ERTS images obtained in the winter showed that even though the total-kill could be separated from heavy-kill damage zones, total-kill could not be consistently separated from clear-cut logging, burned areas, frozen lakes and bogs. Author

N74-30717* California Univ., Berkeley. Center for Remote Sensing Research.
A TIMER INVENTORY BASED UPON MANUAL AND AUTOMATED ANALYSIS OF ERTS-1 AND SUPPORTING AIRCRAFT DATA USING MULTISTAGE PROBABILITY SAMPLING
James D. Nichols, Mike Gialdini, and Sipi Jaakkola *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 145-157 (For availability see N74-30705 20-13)
(Paper-A10) CSCL 02F

A quasi-operational study demonstrating that a timber inventory based on manual and automated analysis of ERTS-1, supporting aircraft data and ground data was made using multistage sampling techniques. The inventory proved to be a timely, cost effective alternative to conventional timber inventory techniques. The timber volume on the Quincy Ranger District of the Plumas National Forest was estimated to be 2.44 billion board feet with a sampling error of 8.2 percent. Costs per acre for the inventory procedure at 1.1 cent/acre compared favorably with the costs of a conventional inventory at 25 cents/acre. A point-by-point comparison of CALSCAN-classified ERTS data with human-interpreted low altitude photo plots indicated no significant differences in the overall classification accuracies. Author

N74-30718* Nuclear Research Center, Athens (Greece).
APPLICATION OF ERTS-1 IMAGERY TO LAND USE, FOREST DENSITY AND SOIL INVESTIGATIONS IN GREECE
N. J. Yassoglou, E. Skordalakis, and A. Koutalos *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A

1974 p 159-182 refs (For availability see N74-30705 20-13) (Paper-A11) CSCL 02F

Photographic and digital imagery received from ERTS-1 was analyzed and evaluated as to its usefulness for the assessment of agricultural and forest land resources. Black and white, and color composite imagery provided spectral and spatial data, which, when matched with temporal land information, provided the basis for a semidetailed land use and forest site evaluation chartography. Color composite photographs have provided some information on the status of irrigation of agricultural lands. Computer processed digital imagery was successfully used for detailed crop classification and semidetailed soil evaluation. The results and techniques of this investigation are applicable to ecological and geological conditions similar to those prevailing in the Eastern Mediterranean. Author

N74-30719* South Dakota State Univ., Brookings. Plant Science Dept.

ERTS-1 MSS IMAGERY: ITS USE IN DELINEATING SOIL ASSOCIATIONS AND AS A BASE MAP FOR PUBLISHING SOILS INFORMATION

Frederick C. Westin *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 183-204 refs (For availability see N74-30705 20-13)
(Contract NAS5-21774)
(Paper-A12; SDSU-RSI-J-73-11) CSCL 08M

ERTS 1 imagery is a useful tool in the identification and refinement of soil association areas and an excellent base map upon which soil association information can be published. Prints of bands 5 and 7 were found to be most useful to help delineate major soil and vegetation areas. After delineating major soil areas, over 4800 land sale prices covering a period of 1967-72 were located in the soil areas and averaged. The soil association then were described as soil association value areas and published on a 1:1,000,000 scale ERTS mosaic of South Dakota constructed using negative prints of band 7. The map is intended for use by state and county revenue officers, by individual buyers and sellers of land and lending institutions, and as a reference map by those planning road routes and cable lines and pipelines. Author

N74-30720* Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

MAPPING SOILS, CROPS, AND RANGELANDS BY MACHINE ANALYSIS OF MULTITEMPORAL ERTS-1 DATA

Marion F. Baumgardner and James A. Henderson, Jr. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 205-223 (For availability see N74-30705 20-13)
(Paper-A13) CSCL 08B

ERTS-1 data, obtained during the period 25 August 1972 to 5 September 1973 over a range of test sites in the Central United States, have been used for identifying and mapping differences in soil patterns, species and conditions of cultivated crops, and conditions of rangelands. Multispectral scanner data from multiple ERTS passes over certain test sites have provided the opportunity to study temporal changes in the scene. Multispectral classifications delineating soils boundaries in different test sites compared well with existing soil association maps prepared by conventional means. Spectral analysis of ERTS data was used to identify, maps, and make areal measurements of wheat in western Kansas. Multispectral analysis of ERTS-1 data provided patterns in rangelands which can be related to soils differences, range management practices, and the extent of infestation of grasslands by mesquite (prosopis fuliflora) and juniper (juniperus spp.). Author

N74-30721* Nebraska Univ., Lincoln. Dept. of Agronomy.

APPLICATION OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA

Paul M. Seevers, David T. Lewis, and James V. Drew *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 225-232 (For availability see N74-30705 20-13)
(Paper-A14) CSCL 08B

Interpretations of imagery from the Earth Resources Technology Satellite (ERTS-1) indicate that soil associations and attendant range sites can be identified on the basis of vegetation and topography using multi-temporal imagery. Optical density measurements of imagery from the visible red band of the multispectral scanner (MSS band 5) obtained during the growing season were related to field measurements of vegetative biomass, a factor that closely parallels range condition class on specific range sites. ERTS-1 imagery also permitted inventory and assessment of center-pivot irrigation systems in the Sand Hills region in relation to soil and topographic conditions and energy requirements. Author

N74-30722* Centre for Overseas Pest Research, London (England).

ERTS SURVEYS A 500 km SQUARED LOCUST BREEDING SITE IN SAUDI ARABIA c04

D. E. Pedgley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 233-246 (For availability see N74-30705 20-13)
(Paper-A15) CSCL 06C

From September 1972 to January 1973, ERTS-1 precisely located a 500 sq km area on the Red Sea coastal plain of Saudi Arabia within which the Desert Locust (Schistocerca gregaria, Forsk.) bred successfully and produced many small swarms. Growth of vegetation shown by satellite imagery was confirmed from ground surveys and raingauge data. The experiment demonstrates the feasibility of detecting potential locust breeding sites by satellite, and shows that an operational satellite would be a powerful tool for routine survey of the 3 x 10 to the 7th power sq km invasion area of the Desert Locust in Africa and Asia, as well as of other locust species in the arid and semi-arid tropics. Author

N74-30723* American Univ., Washington, D.C. Dept. of Biology.

REMOTE SENSING EXPERIMENT IN WEST AFRICA

N. H. MacLeod *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 247-266 (For availability see N74-30705 20-13)
(Paper-A16) CSCL 02C

There are substantial needs of the Sahelien Zone to detail the state of regional agricultural resources in the face of a sixth year of serious drought conditions. While most of the work has been done in the Republic of Niger, the principles which have emerged from the analysis seem to be applicable to much of the Sahel. The discussion relates to quite specific rehabilitation and development initiations under consideration in Niger which are based in part upon direct analysis of ERTS imagery of the country, in part on field surveys and on discussions with Nigerian officials and technicians. Again, because the entire Sahelien Zone (including Niger) has large zones of similar ecologic characteristics, modificiations of the approaches suggested for Niger are applicable to the solution of rehabilitation of the desert, the savannah and the woodlands of West Africa in general. Author

N74-30724* Nevada Univ., Reno. Remote Sensing Lab.

NATURAL RESOURCE INVENTORIES AND MANAGEMENT APPLICATIONS IN THE GREAT BASIN

Paul T. Tueller, Garwin Lorain, and Ronald M. Halvorson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 267-289 refs (For availability see N74-30705 20-13)
(Paper-A17) CSCL 08F

ERTS-1 resolution capabilities and repetitive coverage have allowed the acquisition of several statewide inventories of natural resource features not previously completed or that could not be completed in any other way. Familiarity with landform, tone, pattern and other converging factors, along with multidate imagery, has been required. Nevada's vegetation has been mapped from ERTS-1. Dynamic characteristics of the landscape have been studied. Sequential ERTS-1 imagery has proved its usefulness for mapping vegetation, following vegetation phenology changes, monitoring changes in lakes and reservoirs (including water quality), determining changes in surface mining use, making fire fuel estimates and determining potential hazard, mapping the distribution of rain and snow events, making range readiness determinations, monitoring marshland management practices and other uses. Feasibility has been determined, but details of incorporating the data in management systems awaits further research and development. The need is to accurately define the

steps necessary to extract required or usable information from ERTS imagery and fit it into on-going management programs.
Author

N74-30725* Bureau of Land Management, Denver, Colo.
USEFULNESS OF ERTS-1 SATELLITE IMAGERY AS A DATA-GATHERING TOOL BY RESOURCE MANAGERS IN THE BUREAU OF LAND MANAGEMENT
R. Gordon Bentley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 291-299 ref (For availability see N74-30705 20-13)
(Paper-A18) CSCL 08B

ERTS-1 satellite imagery can be an effective data-gathering tool for resource managers. Techniques are developed which allow managers to visually analyze simulated color infrared composite images to map perennial and ephemeral (annual) plant communities. Tentative results indicate that ephemeral plant growth and development and potential to produce forage can be monitored.
Author

N74-30726* Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).
VEGETATION MAPPING FROM ERTS IMAGERY OF THE OKAVANGO DELTA
Douglas T. Willamson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 301-308 refs (For availability see N74-30705 20-13)
(Paper-A19) CSCL 08B

The Okavango is Botswana's major water resource. The present study has been specifically directed at mapping vegetation types within the delta and generally concerned with finding what information of value to plant and animal ecologists could be extracted from the imagery. To date it has been found that. (1) It is possible to map broad vegetation types from the imagery. (2) Imagery of the delta records the state of the system in a manner which will facilitate long-term studies of plant succession. (3) Phenological events can be detected. (4) The imagery can be used to detect and map wild fires. This will be useful in determining the role of fire in the ecology of the region. Using the imagery it is thus possible to map existing vegetation and monitor both short and long-term changes.
Author

N74-30727* Texas A&M Univ., College Station.
MONITORING VEGETATION SYSTEMS IN THE GREAT PLAINS WITH ERTS
J. W. Rouse, Jr., R. H. Haas, J. A. Schell, and D. W. Deering *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 309-317 (For availability see N74-30705 20-13)
(Paper-A20) CSCL 08F

The Great Plains Corridor rangeland project utilizes natural vegetation systems as phenological indicators of seasonal development and climatic effects upon regional growth conditions. A method has been developed for quantitative measurement of vegetation conditions over broad regions using ERTS-1 MSS data. Radiance values recorded in ERTS-1 spectral bands 5 and 7, corrected for sun angle, are used to compute a band ratio parameter which is shown to be correlated with aboveground green biomass on rangelands.
Author

N74-30728* National Research Council, Bangkok (Thailand).
AGRICULTURAL UTILIZATION OF ERTS-1 DATA IN THAILAND
Pradisth Cheosakul, Boon Indrambarya, Joseph O. Morgan, and Suvit Vibulsresth *In* NASA. Goddard Space Flight Center 3d ERTS-/1 Symp., Vol. 1, Sect. A 1974 p 319-329 (For availability see N74-30705 20-13)
(Paper-A21) CSCL 02C

Recent advances made in three disciplinary areas that are of major importance to Thailand are briefly discussed. These areas are; (1) agriculture, (2) forestry, and (3) land use. Preliminary investigations of the ERTS-1 data have been so successful that the Thai Government has decided to develop a remote sensing data handling and research center.
Author

N74-30729* National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
COMPUTER-IMPLEMENTED LAND USE CLASSIFICATION WITH PATTERN RECOGNITION SOFTWARE AND ERTS DIGITAL DATA c08
Armond T. Joyce *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 331-337 (For availability see N74-30705 20-13)
(Paper-L1) CSCL 09B

Significant progress has been made in the classification of surface conditions (land uses) with computer-implemented techniques based on the use of ERTS digital data and pattern recognition software. The supervised technique presently used at the NASA Earth Resources Laboratory is based on maximum likelihood ratioing with a digital table look-up approach to classification. After classification, colors are assigned to the various surface conditions (land uses) classified, and the color-coded classification is film recorded on either positive or negative 9 1/2 in. film at the scale desired. Prints of the film strips are then mosaicked and photographed to produce a land use map in the format desired. Computer extraction of statistical information is performed to show the extent of each surface condition (land use) within any given land unit that can be identified in the image. Evaluations of the product indicate that classification accuracy is well within the limits for use by land resource managers and administrators. Classifications performed with digital data acquired during different seasons indicate that the combination of two or more classifications offer even better accuracy.
Author

N74-30730* Geological Survey, Washington, D.C.
REMOTE SENSING OF LAND USE CHANGES IN US METROPOLITAN REGIONS: TECHNIQUES OF ANALYSIS AND OPPORTUNITIES FOR APPLICATION
James R. Wray *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 339 (For availability see N74-30705 20-13)
(Paper-L2) CSCL 08B

A graphic description is given of the Census Cities ERTS experiment in urban change detection using remote sensors. The relationship or model between land use data from sensors and socio-demographic data from the census is partly demonstrated. The example suggests how knowledge of land use changes acquired by sensors can be used to make estimates of population, and other attributes. The feasibility of nationwide mapping of land use, and land use changes, by direct computer classification of ERTS-1 multispectral digital data is also demonstrated. Potential applications in state and regional planning are many, and some are named. But the longer-range gains are likely to be improved understanding by legislators, managers and voters as to what it is that makes the country tick. One of the specific tasks could be the allocation of revenues to be shared.
Author

N74-30731* Minnesota Univ., Minneapolis.
ERTS-1 ROLE IN LAND MANAGEMENT AND PLANNING IN MINNESOTA
Joseph E. Sizer (Minn. State Planning Agency) and Dwight Brown *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A. 1974 p 341-350 (For availability see N74-30705 20-13)
(Paper-L3) CSCL 08B

Research on applications of ERTS-1 imagery to land use has focused on evaluating the ability of ERTS-1 imagery to update and refine the detail of land use information in the Minnesota Land Management Information System. Work has been directed toward defining the capabilities of the ERTS-1 system to provide information about surface cover by identifying forest, water, and wetland resources; urban and agricultural development: and testing and evaluating data input and output procedures. As capabilities were developed, meetings were held with administrators and resource information users from various agencies of government to identify their information needs. A full scale systems test for several selected pilot areas in the state is nearly complete. Users have been identified for each test area and they have been instrumental in identifying data requirements and analysis needs for administrative purposes. Users have both rural and urban orientations and provide a basis for evaluation of the results.
Author

N74-30732* General Electric Co., Philadelphia, Pa. Space Div.
INTERACTIVE ANALYSIS AND EVALUATION OF ERTS

DATA FOR REGIONAL PLANNING AND URBAN DEVELOPMENT: A LOS ANGELES BASIN CASE STUDY

Surendra Raje, Richard Economy, Gerald Willoughby (OVAACS Intern., Inc.), and Jene McKnight (Regional Planning Commission, Los Angeles) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 351-369 (For availability see N74-30705 20-13)
(Paper-L4) CSCL 08B

The progression endemic to the ERTS Data Use Experiment SR 124 in data quality, analysis sophistication and applications responsiveness is reviewed. The roles of the variety of ERTS products, including the supporting underflight aircraft imagery at various scales, are discussed in the context of this investigation. The versatility of interpretation techniques and outputs developed and implemented via the General Electric Multispectral Information Extraction Systems is described and exemplified by both system-expository and applications-explanatory products. The wide-ranging and in-depth applications studied in the course of this experiment can be characterized as community-oriented and agency-directed. In the former, generic category, which is primarily data-contentual, problems analyzed dealt with agricultural systems, surface water bodies, snow cover, brush fire burns, forestry, grass growth, parks - golf courses - cemeteries, dust storms, grading sites, geological features and coastal water structure. The ERTS MSS band selectivity and measurements thresholds were of primary interest here. The agency-directed application areas have been user-evaluational in nature. Beginning with overall urbanized regional analysis of land cover density-development intensity, residential areas were analyzed for ascertaining if housing types could be aggregated with any degree of reliability. Author

N74-30733* Dartmouth Coll., Hanover, N.H. Project in Remote Sensing.

EVALUATION OF ERTS-1 DATA FOR ACQUIRING LAND USE DATA OF NORTHERN MEGALOPOLIS

Robert B. Simpson, David T. Lindgren, and William D. Goldstein *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 371-381 (For availability see N74-30705 20-13)
(Paper-L5) CSCL 08B

State planners are increasingly becoming interested in ERTS as a possible method for acquiring land use data. An important consideration to them is whether ERTS can provide such data at a savings in both time and money over alternative systems. A preliminary evaluation of ERTS as a planning tool is given. Author

N74-30734* National Physical Research Lab., Pretoria (South Africa).

THE VALUE OF ERTS-1 IMAGERY IN RESOURCE INVENTORIZATION ON A NATIONAL SCALE IN SOUTH AFRICA

O. G. Malan, C. N. MacVicar (Soil and Irrigation Res. Inst., Pretoria), D. Edwards (Botan. Res. Inst., Pretoria), B. N. Temperley (Geol. Survey, Pretoria), L. Claassen (Dept. of Planning and the Environ., Pretoria) et al *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 383-392 (For availability see N74-30705 20-13)
(Paper-L6) CSCL 08B

It has been shown that ERTS imagery, particularly in the form of 1:500,000 scale false color photolithographic prints, can contribute very significantly towards facilitating and accelerating (dramatically, in some cases) resource surveys and geologic mapping. Fire mapping on a national scale becomes a feasability; numerous new geologic features, particularly lineaments, have been discovered, land use can be mapped efficiently on a regional scale and degraded areas identified. The first detailed tectonic and geomorphological maps of the Republic of South Africa will be published mainly owing to the availability of ERTS images. Author

N74-30735* Geological Survey, Washington, D.C. Geographic Applications Program.

CHANGE IN LAND USE IN THE PHOENIX (1:250,000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1973: ERTS AS AN AID IN A NATIONWIDE PROGRAM FOR MAPPING GENERAL LAND USE

John L. Place *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 393-423 (For availability see N74-30705 20-13)
(Paper-L7) CSCL 08B

Changes in land use between 1970 and 1973 in the Phoenix (1:250,000 scale) Quadrangle in Arizona have been mapped using only the images from ERTS-1, tending to verify the utility of a standard land use classification system proposed for use with ERTS images. Types of changes detected have been: (1) new residential development of former cropland and rangeland; (2) new cropland from the desert; and (3) new reservoir fill-up. The seasonal changing of vegetation patterns in ERTS has complemented air photos in delimiting the boundaries of some land use types. ERTS images, in combination with other sources of information, can assist in mapping the generalized land use of the fifty states by the standard 1:250,000 quadrangles. Several states are already working cooperatively in this type of mapping. Author

N74-30736* Wisconsin Univ., Madison. Environmental Monitoring and Data Acquisition Group.

THE APPLICATION OF ERTS-1 DATA TO THE LAND USE PLANNING PROCESS

James L. Clapp, Ralph W. Kiefer, Edward L. Kuhlmey, and Bernard J. Niemann, Jr. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 425-438 (For availability see N74-30705 20-13)
(Paper-L8) CSCL 08B

Land resource data has been extracted on a percent of cell basis from ERTS imagery, RB-57 color infrared imagery and best available conventional sources for a 10,000 square kilometer test area in eastern Wisconsin. First, the data from the three sources is compared on a spatial basis for a 300 square kilometer portion of the test area. For those land resource variables associated with cover, ERTS derived resource data compared favorably with both the RB-57 and conventional data. Second, the effect of the data source on land use decisions is examined. Three interstate highway corridors are located through the same region based upon data extracted from each of the three sources. A policy of preserving natural environmental systems was used as a basis for the corridors selection in each case. The resulting three corridors compare favorably. Author

N74-30737* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE UTILITY OF ERTS-1 DATA FOR APPLICATIONS IN LAND USE CLASSIFICATION

John E. Dornbach and Gerald E. McKain *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 439-455 refs (For availability see N74-30705 20-13)
(Paper-L9) CSCL 08B

A comprehensive study has been undertaken to determine the extent to which conventional image interpretation and computer-aided (spectral pattern recognition) analysis techniques using ERTS-1 data could be used to detect, identify (classify), locate, and measure current land use over large geographic areas. It can be concluded that most of the level 1 and 2 categories in the USGS Circular no. 671 can be detected in the Houston-Gulf Coast area using a combination of both techniques for analysis. These capabilities could be exercised over larger geographic areas, however, certain factors such as different vegetative cover, topography, etc. may have to be considered in other geographic regions. The best results in identification (classification), location, and measurement of level 1 and 2 type categories appear to be obtainable through automatic data processing of multispectral scanner computer compatible tapes. Author

N74-30738* California Univ., Santa Barbara. Geography Remote Sensing Unit (GRSU).

APPLICATION OF ERTS-1 SATELLITE IMAGERY FOR LAND USE MAPPING AND RESOURCE INVENTORIES IN THE CENTRAL COASTAL REGION OF CALIFORNIA

John E. Estes, Randolph R. Thaman, and Leslie W. Senger *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 457-490 (For availability see N74-30705 20-13)
(Paper-L10) CSCL 08B

ERTS-1 satellite imagery has proved a valuable data source

for land use as well as natural and cultural resource studies on a regional basis. ERTS-1 data also provide an excellent base for mapping resource related features and phenomena. These investigations are focused on a number of potential applications which are already showing promise of having operational utility. Author

N74-30739* Cornell Univ., Ithaca, N.Y. New York State Coll. of Agriculture and Life Sciences.
EVALUATION OF ERTS-1 IMAGERY FOR LAND USE/ RESOURCE INVENTORY INFORMATION
Ernest E. Hardy, James E. Skaley, and Elmer S. Phillips *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 491-495 (For availability see N74-30705 20-13)
(Paper-L11) CSCL 08B

This investigation was to develop a low cost, manual technique for enhancing ERTS-1 imagery and preparing it in suitable format for use by users with wide and varied interests related to land use and natural resources information. The goals were: to develop enhancement techniques based on concepts and practices extant in photographic sciences, to provide a means of allowing productive interpretation of the imagery by manual means, to produce a product at low cost, to provide a product that would have wide applications, and one compatible with existing information systems. Cost of preparation of the photographically enhanced, enlarged negatives and positives and the diazo materials is about 1 cent per square mile. Cost of creating and mapping a land use classification of twelve use types at a scale of 1:250,000 is only $1 per square mile. The product is understood by users, is economical, and is compatible with existing information systems. Author

N74-30740* New Jersey Dept. of Environmental Protection, Trenton.
IMPACT OF ERTS-1 IMAGES ON MANAGEMENT OF NEW JERSEY'S COASTAL ZONE
Edward B. Feinberg, Roland S. Yunghans, JoAnn Stitt, and Robert L. Mairs (Earth Satellite Corp., Washington, D. C.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 497-503 (For availability see N74-30705 20-13)
(Paper-L12) CSCL 08B

The thrust of New Jersey's ERTS investigation is development of procedures for operational use of ERTS-1 data by the Department of Environmental Protection in the management of the State's coastal zone. Four major areas of concern were investigated: detection of land use changes in the coastal zone; monitoring of offshore waste disposal; siting of ocean outfalls; and allocation of funds for shore protection. ERTS imagery was not useful for shore protection purposes; it was of limited practical value in the evaluation of offshore waste disposal and ocean outfall siting. However, ERTS imagery shows great promise for operational detection of land use changes in the coastal zone. Some constraints for practical change detection have been identified. Author

N74-30741* Geological Survey, Reston, Va. Geographic Applications Program.
CARETS: AN EXPERIMENTAL REGIONAL INFORMATION SYSTEM USING ERTS DATA
Robert H. Alexander *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 505-522 refs (For availability see N74-30705 20-13)
(Paper-L13) CSCL 08F

The U. S. Geological Survey CARETS (Central Atlantic Regional Ecological Test Site)/ERTS investigation is testing the applicability of ERTS data as input to an environmental information system for a multi-state mid-Atlantic region surrounding the Chesapeake and Delaware Bays. The information system framework encompasses a flow of information through several stages from sensor to user, and involving evaluation and feedback from several potential users. Basic assumptions of the CARETS project model are that there is a measurable environmental impact associated with land use and land use change as determined with remote sensor data, and that the ERTS derived land use data sets, when properly calibrated, may thus provide regional planners and administrators with a shortcut to an understanding of the environmental changes that are going on in their regions. Author

N74-30742* Food and Agriculture Organization of the United Nations, Rome (Italy).
CONCEPTS OF INTEGRATED SATELLITE SURVEYS
J. A. Howard *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 523-537 refs (For availability see N74-30705 20-13)
(Paper-L14) CSCL 22C

The United Nations initially contracted with NASA to carry out investigations in three countries; but now as the result of rapidly increasing interest, ERTS imagery has been/is being used in 7 additional projects related to agriculture, forestry, land-use, soils, landforms and hydrology. Initially the ERTS frames were simply used to provide a synoptic view of a large area of a developing country as a basis to regional surveys. From this, interest has extended to using reconstituted false color imagery and latterly, in co-operation with Purdue University, the use of computer generated false color mosaics and computer generated large scale maps. As many developing countries are inadequately mapped and frequently rely on outdated maps, the ERTS imagery is considered to provide a very wide spectrum of valuable data. Thematic maps can be readily prepared at a scale of 1:250,000 using standard NASA imagery. These provide coverage of areas not previously mapped and provide supplementary information and enable existing maps to be up-dated. There is also increasing evidence that ERTS imagery is useful for temporal studies and for providing a new dimension in integrated surveys. Author

N74-30743* Geological Survey, Reston, Va.
TOWARDS AN OPERATIONAL ERTS - REQUIREMENTS FOR IMPLEMENTING CARTOGRAPHIC APPLICATIONS OF AN OPERATIONAL ERTS TYPE SATELLITE
Alden P. Colvocoresses *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 539-557 refs (For availability see N74-30705 20-13)
(Paper-L15) CSCL 08B

After nearly 18 months of successful operation of the first Earth Resources Technology Satellite (ERTS-1), a careful look at the future in order. Judging from the results of ERTS-1 experiments, public sales of ERTS-1 products and overall worldwide response it is believed that ERTS-1 has demonstrated an earth sensing mode that should become operational. It is recognized that several studies leading to the definition of an operational ERTS have been made. However cartographic requirements are generally more basic and demanding than those of the earth science disciplines and are therefore treated separately in this report. One assumption made is that the configuration of ERTS, particularly with respect to the multispectral scanner and data transmission rates cannot be materially altered. Author

N74-30744* Servicio Geologico de Bolivia, La Paz.
EARTH RESOURCES TECHNOLOGY SATELLITE DATA COLLECTION PROJECT, ERTS - BOLIVIA
Carlos Brockmann *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 559-577 refs (For availability see N74-30705 20-13)
(Paper-L16) CSCL 08B

The Earth Resources Technology Satellite program of Bolivia has developed a multidisciplinary project to carry out investigations in cartography and to prepare various thematic maps. In cartography, investigations are being carried out with the ERTS-1 images and with existing maps, to determine their application to the preparation of new cartographic products on one hand and on the other to map those regions where the cartography is still deficient. The application of the MSS images to the geological mapping has given more than satisfactory results. Working with conventional photointerpretation, it has been possible to prepare regional geological maps, tectonic maps, studies relative to mining, geomorphological maps, studies relative to petroleum exploration, volcanological maps and maps of hydrologic basins. In agriculture, the ERTS images are used to study land classification and forest and soils mapping. Author

N74-30745* Engineer Agency for Resources Inventories, Washington, D.C.
AN OPERATIONAL APPLICATION OF ERTS-1 IMAGERY

TO THE ENVIRONMENTAL INVENTORY PROCESS
James D. ONeal and James R. Bwins *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 579-584 (For availability see N74-30705 20-13)
(Paper-L17) CSCL 08F

A discussion is presented of how The Engineer Agency for Resources Inventories utilized ERTS remotely sensed imagery as a/supplement to airphotos and collateral data for an environmental impact study of the Atchafalaya Basin for the New Orleans engineer district. This single overall inventory permitted a systematic approach and substantial economy for a number of engineering projects for which environmental impact statements would be required. The study area covered approximately 25,000 square miles and included all or part of 36 parishes in Louisiana and 8 counties in Mississippi. It was concluded that as a supplementary source, used in conjunction with airphotos, ERTS had proven itself as a significant means of economy. As a primary source, the Engineer Agency is not yet ready to accept ERTS for their own particular applications. A.L.

N74-30746* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PHOTOINTERPRETATION OF ERTS-A MULTISPECTRAL IMAGES ANALYSIS OF VEGETATION AND LAND USE FOR THE VALENCIA LAKE BASIN REGION
F. Salas, M. Pineda, and A. Arismendi *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 585-593 (For availability see N74-30705 20-13)
(Paper-L18) CSCL 08B

The area of investigation includes part of the Central and Capital Region of Venezuela. Climatic conditions define the existence of different ecological associations with biological forms well defined in their physiognomic complexity as they reach complete development in environments related to gross geomorphic units: coastal area, northern mountain range, fluviolacustrines plains, southern mountain range, southern ridges and parts of Venezuelan central plains. In this area, rainfall varies from 600 mm to 2000 mm and evapotranspiration indexes indicate the existence of vegetation for semiarid conditions (tropical very dry forest) as well as vegetation for very humid conditions (very humid premontane forest). This project was designed for: (1) Location of areas with representative ecosystems for the purpose of managing planning. (2) Identification of structural and physiognomic characteristics of vetetation. (3) Assessment of human activity effects on environmental debasement. (4) Definition of the content and possibilities of orbital ERTS images for the study of urban and rural land use. (5) Setting photointerpretation patterns applicable to areas of similar gross environmental conditions. Author

N74-30747* Wyoming Univ., Laramie. Dept. of Geology.
APPLICATION OF THE ERTS SYSTEM TO THE STUDY OF WYOMING RESOURCES WITH EMPHASIS ON THE USE OF BASIC DATA PRODUCTS
Robert S. Houston, Ronald W. Marrs, Roy M. Breckenridge, and D. L. Blackstone, Jr. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 595-619 refs (For availability see N74-30705 20-13)
(Paper-G1) CSCL 08G

Many potential users of ERTS data products and other aircraft and satellite imagery are limited to visual methods of analyses of these products. Illustrations are presented from Wyoming studies that have employed these standard data products for a variety of geologic and related studies. Possible economic applications of these studies are summarized. Studies include regional geologic mapping for updating and correcting existing maps and to supplement incomplete regional mapping; illustrations of the value of seasonal images in geologic mapping; specialized mapping of such features as sand dunes, playa lakes, lineaments, glacial features, regional facies changes, and their possible economic value; and multilevel sensing as an aid in mineral exploration. Examples of cooperative studies involving botanists, plant scientists, and geologists for the preparation of maps of surface resources that can be used by planners and for environmental impact studies are given. Author

N74-30748* Missouri Geological Survey and Water Resources, Rolla.
SUMMARY OF AN INTEGRATED ERTS-1 PROJECT AND ITS RESULTS AT THE MISSOURI GEOLOGICAL SURVEY
James A. Martin, William H. Allen, David L. Rath, and Ardel Rueff *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 621-631 refs (For availability see N74-30705 20-13)
(Paper-G2) CSCL 08G

Use of the ERTS imagery involved the recognition and interpretation of various ground patterns. Analysis and application are tied to ongoing programs. Specific studies utilizing the imagery and NASA aircraft photography are: a statewide lake and dam inventory; assessment of flooding and floodprone areas along the Missouri portion of the Mississippi and Missouri Rivers; land-use classification for several counties; structural features in selected areas; and Pleistocene features in northern Missouri. Though it has been suggested that repetitive coverage is not necessary for geologic studies, it is this specific feature along with the synoptic view of large portions of the State that provided the potential for the utilization of the ERTS imagery in Missouri. Other State agencies, Departments of Conservation, Agriculture, and Community Affairs, have expressed interest in the potential application of ERTS data in their respective fields. Author

N74-30749* Geological Survey, Menlo Park, Calif.
ANALYSIS OF STATE OF VEHICULAR SCARS ON ARCTIC TUNDRA, ALASKA
Ernest H. Lathram *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 633-641 refs (For availability see N74-30705 20-13)
(Paper-G3) CSCL 08L

Identification on ERTS images of severe vehicular scars in the northern Alaska tundra suggests that, if such scars are of an intensity or have spread to a dimension such that they can be resolved by ERTS sensors (20 meters), they can be identified and their state monitored by the use of ERTS images. Field review of the state of vehicular scars in the Umiat area indicates that all are revegetating at varying rates and are approaching a stable state. Author

N74-30750* Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).
THE INFLUENCE OF SEASONAL FACTORS ON THE RECOGNITION OF SURFACE LITHOLOGIES FROM ERTS-IMAGERY OF THE WESTERN TRANSVAAL
Jan Grootenboer *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 643-655 ref (For availability see N74-30705 20-13)
(Paper-G4) CSCL 08G

The value to geological studies of repetitive ERTS-imagery was investigated by comparing two images gathered during different seasons over an area in the western Transvaal Province of the Republic of South Africa. The first of the two images (1050-07355) was gathered on September 11th., 1972, co-inciding with the end of the dry winter season. The second image (1158-07363) was gathered in the middle of the summer rainfall season on December 28th., 1972. A comparison of the two images reveals striking differences in the amount of recognizable geological detail. The differences exhibited by the two images clearly demonstrate the importance of repetitive ERTS coverage in geological investigations, particularly in areas of marked seasonal variations. Author

N74-30751* Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).
STRATIGRAPHIC SUBDIVISION OF THE TRANSVAAL DOLOMITE FROM ERTS IMAGERY
Jan Grootenboer, Ken Eriksson (Univ. of Witwatersrand, Johannesburg), and John Truswell (Univ. of Witwatersrand, Johannesburg) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 657-664 refs (For availability see N74-30705 20-13)
(Paper-G5) CSCL 08E

ERTS imagery has revealed the presence of broad stratigraphic subdivisions in the previously undifferentiated Transvaal Dolomite of the western Tranvaal, Republic of South Africa. While detailed field mapping in areas of good outcrop, as well as borehole logging has recently led to the recognition of a stratigraphy in the Transvaal Dolomite of the central Transvaal, poor outcrop in

the western Transvaal has to date prevented this. The ERTS-imagery, however, clearly reveals the presence of six, and in the far west seven, distinct stratigraphic zones extending along strike for a distance of at least 200 km. The investigation clearly demonstrates the potential applications of ERTS-imagery in geological studies, even in a country where the geology is supposedly well known. Author

N74-30752* Geological Survey, Denver, Colo.
AN INVESTIGATION OF MAJOR SAND SEAS IN DESERT AREAS THROUGHOUT THE WORLD
Edwin D. McKee and Carol S. Breed (Geological Survey, Flagstaff, Ariz.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 665-679 (For availability see N74-30705 20-13)
(Paper-G6) CSCL 20M

This study of sand seas on a global scale consists of identifying and measuring characteristic sand forms, examining structures, determining the processes involved, and ascertaining the world distribution of various types of sand bodies. Fifteen major areas or sites in the Eastern Hemisphere and three sites in the Western Hemisphere have been examined. In this study an attempt is made to develop a strictly objective classification of worldwide application. Ultimate objectives are threefold. First, a better understanding of stratification in ancient rocks of dune origin; such structures are important in the migration of water and oil. Second, a further insight into the controls of sand migration that in some areas adversely affects various enterprises of man may be obtained. Finally, an appreciation of certain similar patterns on Mars, apparently wind-formed, may result. Author

N74-30753* Geological Survey, Menlo Park, Calif.
A NEW METHOD FOR MONITORING GLOBAL VOLCANIC ACTIVITY
Peter L. Ward, Elliot Endo, David H. Harlow, Rex Allen, and Jerry P. Eaton *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 681-689 (For availability see N74-30705 20-13)
(Paper-G7) CSCL 08F

The ERTS Data Collection System makes it feasible for the first time to monitor the level of activity at widely separated volcanoes and to relay these data rapidly to one central office for analysis. While prediction of specific eruptions is still an evasive goal, early warning of a reawakening of quiescent volcanoes is now a distinct possibility. A prototypical global volcano surveillance system was established under the ERTS program. Instruments were installed in cooperation with local scientists on 15 volcanoes in Alaska, Hawaii, Washington, California, Iceland, Guatemala, El Salvador and Nicaragua. The sensors include 19 seismic event counters that count four different sizes of earthquakes and six biaxial borehole tiltmeters that measure ground tilt with a resolution of 1 microradian. Only seismic and tilt data are collected because these have been shown in the past to indicate most reliably the level of volcano activity at many different volcanoes. Furthermore, these parameters can be measured relatively easily with new instrumentation. Author

N74-30754* New York State Museum and Science Service, Albany.
EVALUATION OF ERTS IMAGERY FOR SPECTRAL GEOLOGICAL MAPPING IN DIVERSE TERRANES OF NEW YORK STATE
Y. W. Isachsen, R. H. Fakundiny, and S. W. Forster *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 691-717 refs (For availability see N74-30705 20-13)
(Paper-G8) CSCL 08G

Linear anomalies dominate the new geological information derived from ERTS-1 imagery, total lengths now exceeding 6000 km. Experimentation with a variety of viewing techniques suggests that conventional photogeologic analyses of band 7 results in the location of more than 97 percent of all linears found. The maxima on rose diagrams for ERTS-1 anomalies correspond well with those for mapped faults and topographic lineaments, despite a difference in relative magnitudes of maxima thought due to solar illumination direction. A multiscale analysis of linears showed that single topographic linears at 1:2,500,000 became segmented at 1:1,000,000, aligned zones of shorter parallel, en echelon, or conjugate linears at 1:500,000, and still shorter linears lacking obvious alignment at 1:250,000. Visible glacial features include individual drumlins, best seen in winter imagery, drumlinoids, eskers, ice-marginal drainage channels, glacial lake shorelines and sand plains, and end moraines. Author

N74-30755* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
GEOLOGIC APPLICATIONS OF ERTS IMAGES ON THE COLORADO PLATEAU, ARIZONA
Alexander F. H. Goetz, Fred C. Billingsley, Donald P. Elston (Geological Survey, Flagstaff, Ariz.), Ivo Lucchitta (Geological Survey, Flagstaff, Ariz.), and Eugene M. Shoemaker (Calif. Inst. of Tech., Pasadena) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 719-744 refs (For availability see N74-30705 20-13)
(Contract NAS7-100)
(Paper-G9) CSCL 08G

Three areas in central and northern Arizona centered on the (1) Verde Valley, (2) Coconino Plateau, and (3) Shivwits Plateau were studied using ERTS photography. Useful applications results include: (1) upgrading of the existing state geologic map of the Verde Valley region; (2) detection of long NW trending lineaments in the basalt cap SE of Flagstaff which may be favorable locations for drilling for new water supplies; (3) tracing of the Bright Angel and Butte faults to twice their previously known length and correlating the extensions with modern seismic events, showing these faults to be present-day earthquake hazards; (4) discovering and successfully drilling perched sandstone aquifers in the Kaibab Limestone on the Coconino Plateau; and (5) determining the relationship between the Shivwits lavas and the formation of the lower Grand Canyon and showing that the lavas should be an excellent aquifer, as yet untapped. Author

N74-30756* Alaska Univ., College. Geophysical Inst.
ERTS-1, EARTHQUAKES, AND TECTONIC EVOLUTION IN ALASKA
Larry Gedney and James VanWormer *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 745-756 refs (For availability see N74-30705 20-13)
(Paper-G10) CSCL 08K

In comparing seismicity patterns in Alaska with ERTS-1 imagery, it is striking to see the frequency with which earthquake epicenters fall on, or near, lineaments visible on the imagery. Often these lineaments prove to be tectonics faults which have been mapped in the field. But equally as often, existing geologic and tectonic maps show no evidence of these features. The remoteness and inacessibility of most of Alaska is responsible, in large part, for the inadequacy of the mapping. ERTS-1 imagery is filling a vital need in providing much of the missing information, and is pointing out many areas of potential earthquake hazard. Earthquakes in central and south-central Alaska result when the northeastern corner of the north Pacific lithospheric plate underthrusts the continent. North of Mt. McKinley, the seismicity is continental in nature and of shallow origin, with earthquakes occurring on lineaments, and frequently at intersections of lineaments. The shallower events tend to align themselves with lineaments visible on the imagery. Author

N74-30757* Bureau de Recherches Geologiques et Minieres, Orleans (France).
STRUCTURAL INVESTIGATIONS IN THE MASSIF-CENTRAL, FRANCE
J.-Y. Scanvic *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 757-766 refs (For availability see N74-30705 20-13)
(Paper-G11) CSCL 08E

This survey covered the French Massif-Central (where crystalline and volcanic rocks outcrop) and its surrounding sedimentaries, Bassin de Paris, Bassin d'Aquitaine and Rhodanian valley. One objective was the mapping of fracturing and the surveying of its relationship with known ore deposits. During this survey it was found that ERTS imagery outlines lithology in some sedimentary basins. On the other hand, in a basement area, under temperature climate conditions, lithology is rarely expressed. These observations can be related to the fact that band 5 gives excellent results above sedimentary basins in France and generally band 7 is the most useful in a basement area.

Several examples show clearly the value of ERTS imagery for mapping linear features and circular structures. All the main fractures are identified with the exception of new ones found both in sedimentaries and basement areas. Other interesting findings concern sun elevation which, stereoscopic effect not being possible, simulates relief in a better way under certain conditions. Author

N74-30758* Smithsonian Astrophysical Observatory, Cambridge, Mass.
STRUCTURAL GEOLOGY OF THE AFRICAN RIFT SYSTEM: SUMMARY OF NEW DATA FROM ERTS-1 IMAGERY
P. A. Mohr *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 767-782 refs (For availability see N74-30705 20-13)
(Paper-G12) CSCL 08G

ERTS imagery reveals for the first time the structural pattern of the African rift system as a whole. The strong influence of Precambrian structures on this pattern is clearly evident, especially along zones of cataclastic deformation, but the rift pattern is seen to be ultimately independent in origin and nature from Precambrian tectonism. Continuity of rift structures from one swell to another is noted. The widening of the Gregory rift as its northern end reflects an underlying Precambrian structural divergence, and is not a consequence of reaching the swell margin. Although the Western Rift is now proven to terminate at the Aswa Mylonite Zone, in southern Sudan, lineaments extend northeastwards from Lake Albert to the Eastern Rift at Lake Stefanie. The importance of en-echelon structures in the African rifts is seen to have been exaggerated. Author

N74-30759* Colorado School of Mines, Golden.
MINERAL EXPLORATION WITH ERTS IMAGERY
Stephen M. Nicolais *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 785-796 refs (For availability see N74-30705 20-13)
(Contract NAS5-21778)
(Paper-G14) CSCL 08G

Ten potential target areas for metallic mineral exploration were selected on the basis of a photo-lineament interpretation of the ERTS image 1172-17141 in central Colorado. An evaluation of bias indicated that prior geologic knowledge of the region had little, if any, effect on target selection. In addition, a contoured plot of the frequency of photo-lineament intersections was made to determine what relationships exist between the photo-lineaments and mineral districts. Comparison of this plot with a plot of the mineral districts indicates that areas with a high frequency of intersections commonly coincide with known mineral districts. The results of this experiment suggest that photo-lineaments are fractures or fracture-controlled features, and their distribution may be a guide to metallic mineral deposits in Colorado, and probably other areas as well. Author

N74-30760* Geological Research Dept., Randfontein (South Africa).
ERTS-1 IMAGERY AS AN AID TO THE UNDERSTANDING OF THE REGIONAL SETTING OF BASE METAL DEPOSITS IN THE NORTH WEST CAPE PROVINCE, SOUTH AFRICA
Richard P. Viljoen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 797-806 (For availability see N74-30705 20-13)
(Paper-G15) CSCL 08G

A number of base metal finds have recently focussed attention on the North Western Cape Province of South Africa as an area of great potential mineral wealth. From the point of view of competitive mineral exploration it was essential that an insight into the regional geological controls of the base metal mineralization of the area be obtained as rapidly as possible. Conventional methods of producing a suitable regional geological map were considered to be too time-consuming and ERTS-1 imagery was consequently examined. This imagery has made a significant contribution in the compilation of a suitable map on which to base further mineral exploration programmes. The time involved in the compilation of maps of this nature was found to be only a fraction of the time necessary for the production of similar maps using other methods. ERTS imagery is therefore considered to be valuable in producing accurate regional maps in areas where little or no geological data are available, or in areas of poor access. Furthermore, these images have great potential for rapidly defining the regional extent of metallogenic provinces. Author

N74-30761* Geological Survey, Reston, Va.
MAPPING OF HYDROTHERMAL ALTERNATION ZONES AND REGIONAL ROCK TYPES USING COMPUTER ENHANCED ERTS MSS IMAGES
Lawrence C. Rowan, Pamela H. Wetlaufer, F. C. Billingsley (JPL), and Alexander F. H. Goetz (JPL) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 807 (For availability see N74-30705 20-13)
(Paper-G16) CSCL 08E

A combination of digital computer processing and color compositing of ERTS MSS images has been used to map hydrothermal alternation zones and regional rock types in south-central Nevada. The technique is based on enhancement of subtle visible and near infrared reflectivity differences between mineralogically dissimilar rocks, especially unaltered and altered rocks. MSS spectral bands are ratioed, pixel by pixel, in the computer and subsequently stretched. These ratio values are used to produce a new black and white image which shows the subtle spectral reflectivity differences. Additional enhancement is achieved by preparing color composites of two or more stretched ratio images. The choice of MSS bands for rationing depends on the spectral reflectance properties of the rocks to be discriminated. Although this technique is in the initial stage of development and is untested in other areas, it already appears to have considerable potential for targeting mineral prospects and for regional geologic mapping. Author

N74-30762* Eason Oil Co., Oklahoma City, Okla.
AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION
Robert J. Collins, F. P. McCown, L. P. Stonis, Gerlad Petzel, and John R. Everett *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 809-821 Prepared in cooperation with Earth Satellite Corp., Washington, D. C. (For availability see N74-30705 20-13)
(Paper-G17) CSCL 08G

This experiment was designed to determine the types and amounts of information valuable to petroleum exploration extractable from ERTS data and the cost of obtaining the information using traditional or conventional means. It was desired that an evaluation of this new petroleum exploration tool be made in a geologically well known area in order to assess its usefulness in an unknown area. The Anadarko Basin lies in western Oklahoma and the panhandle of Texas. It was chosen as a test site because there is a great deal of published information available on the surface and subsurface geology of the area, and there are many known structures that act as traps for hydrocarbons. This basin is similar to several other large epicontinental sedimentary basins. It was found that ERTS imagery is an excellent tool for reconnaissance exploration of large sedimentary basins or new exploration provinces. For the first time, small and medium size oil companies can rapidly and effectively analyze exploration provinces as a whole. Author

N74-30763* Geological Survey, Reston, Va.
PRELIMINARY ROAD ALINEMENT THROUGH THE GREAT KAVIR IN IRAN BY REPETITIVE ERTS-1 COVERAGE
Daniel B. Krinsley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 823 (For availability see N74-30705 20-13)
(Paper-G18) CSCL 08B

Access to the Great Kavir is generally limited to the period August through October when some salt crusts will support limited vehicular movement. The condition of the salt crusts and their parent sediments during the long wet season have been unknown. This absence of information about the surface of the Great Kavir has prevented an intensive study of a possible road alinement which could shorten the present route between northern and central Iran by 760 km. False color diazo composites of bands 4, 5, and 7 were prepared from positives of ERTS-1 MSS images taken of the Great Kavir. These scenes presented a record of the seasonal hydrologic changes that occurred from the dry to the wet season. During the period of maximum inundation and lowest bearing strengths, as inferred from the image of May 12,

1973, it was possible to select a preliminary road alinement that would avoid the wettest or roughest areas and take advantage of the best terrain and shortest distance. The eventual road alinement should be based on a longer record of observation and on-site investigations. Author

N74-30764* Earth Satellite Corp., Washington, D.C.
RELATIONSHIP OF ROOF FALLS IN UNDERGROUND COAL MINES TO FRACTURES MAPPED ON ERTS-1 IMAGERY
Charles E. Wier (Indiana Geological Survey), Frank J. Wobber, Orville R. Russell, Roger V. Amato, and Thomas V. Leshendok *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 825-843 refs (For availability see N74-30705 20-13)
(Paper-G19) CSCL 08I

ERTS imagery is of unique value for mapping of certain fractures that are not identifiable on aircraft imagery. Because color infrared and ERTS imagery complement each other both sources of data were used to map fractures in western Indiana and eastern Illinois. In the Kings Station Mine, Gibson County, Indiana, most roof falls reported had occurred in areas where mapped fractures were closely spaced and intersecting. Using this information as a basis for extrapolation, roof fall hazard maps were prepared for other mine sites. Various coal resources programs related to energy and environment also were conducted. Author

N74-30765* Gregory Geoscience Ltd., Ottawa (Ontario).
A STUDY OF THE TEMPORAL CHANGES RECORDED BY ERTS AND THEIR GEOLOGICAL SIGNIFICANCE
Harold D. Moore and Alan F. Gregory *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 845-855 refs (For availability see N74-30705 20-13)
(Paper-G20) CSCL 08G

The temporal changes that are recorded by ERTS were evaluated for an area around Bathurst Inlet in the North West Territories. The seasons represented by the images included: early winter, spring, early summer, summer, and fall. Numerous surface characteristics (vegetation, drainage patterns, surface texture, lineament systems and topographic relief, etc.) were used to relate the change in observable features with the different seasons. It was found that the time of year when an observation is made has a strong control over the amount and type of information that can be derived by an experienced interpreter. It was concluded that a detailed study of temporal changes is an important part of any ERTS interpretation for geology. Author

N74-30766* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOLOGICAL EVALUATION AND APPLICATIONS OF ERTS-1 IMAGERY OVER GEORGIA
S. M. Pickering and R. C. Jones *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 857-868 (For availability see N74-30705 20-13)
(Paper-G21) CSCL 08G

ERTS-1 70mm and 9 x 9 film negatives are being used by conventional and color enhancement methods as a tool for geologic investigation. Geologic mapping and mineral exploration by conventional methods is very difficult in Georgia. Thick soil cover and heavy vegetation cause outcrops of bed rock to be small, rare and obscure. ERTS imagery, and remote sensing in general have helped delineate: (1) major tectonic boundaries; (2) lithologic contacts; (3) foliation trends; (4) topographic lineaments; and (5) faults. The ERTS-1 MSS imagery yields the greatest amount of geologic information on the Piedomont, Blue Ridge, and Valley and Ridge Provinces of Georgia where topography is strongly controlled by the bedrock geology. ERTS imagery, and general remote sensing techniques, have provided us with a powerful tool to assist geologic research; have significantly increased the mapping efficiency of our field geologists; have shown new lineaments associated with known shear and fault zones; have delineated new structural features; have provided a tool to re-evaluate our tectonic history; have helped to locate potential ground water sources and areas of aquifer recharge; have defined areas of geologic hazards; have shown areas of heavy siltation in major reservoirs; and by its close interval repetition, have aided in monitoring surface mine reclamation activities and the environmental protection of our intricate marshland system. Author

N74-30767* Ministry of Public Works, Caracas (Venezuela). Directorate of Urban Planning.
ALTITUDE DETERMINATION AND DESCRIPTIVE ANALYSIS OF CLOUDS ON ERTS-1 MULTISPECTRAL PHOTOGRAPHY
Carlos Albrizzio and Adelina Andressen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 869-882 refs (For availability see N74-30705 20-13)
(Paper-G22) CSCL 14E

A simple method to determine the approximate altitude of clouds is described, with the objective of refining their classification using only marginal data from the photographs. Results of the application of this method on photographs of the Goajira Peninsula, Paraguana Peninsula and the Central Coast of Venezuela are presented. Here, the altitudes computed are used to classify clouds and to identify the genus of others without typical form. Instability of air masses through clouds vertical development, and wind direction as well as other local climatic characteristics such as moisture content, loci of condensation, area, etc. are determined using repetitive coverage for the time interval of the photography. Applications for the regional and urban planning (including airport location and flights schedule) and natural resources evaluation are suggested. Author

N74-30768* Ministry of Public Works, Caracas (Venezuela).
GEOLOGICAL PHOTOINTERPRETATION OF THE PARAGUANA PENINSULA USING ERTS-A MULTISPECTRAL PHOTOGRAPHY
Carlos Albrizzio *In* NASA. Goodard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 883-896 refs (For availability see N74-30705 20-13)
(Paper-G23) CSCL 08B

A methodology was developed to evaluate multispectral analysis of orbital imagery on the interpretation of geology, coastal geomorphology and sedimentary processes. The images analyzed were obtained during the pass of ERTS satellite over the center region of Venezuela on October 19, 1972. ERTS-1 multispectral images in black and white paper copies and transparencies of the 4 bands and false color composites at scales of 1:1,000,000 and 1:500,000 were interpreted. Lithology and outcrop patterns of the following geological formations have been interpreted: igneous and metamorphic basement of Cocodite and Santa Ana, Jurassic-Cretaceous metamorphics of Pueblo Nuevo, Cantaure Miocene-Pliocene sediments, and Quaternary alluvium, dunes, beach ridges, bars and reefs. A prominent and extensive Paraguana tonal anomaly shaped as an 8 has been discovered at the NW of the Peninsula. Its erosional origin has exposed light toned lower beds at the center, with additional evidence of topographic depression and development of underground drainage of karst origin. Coastal geomorphology, its processes and energy has been interpreted with the help of wind direction analysis (ENE-WSW) at sea level through the orientation of transported materials (water vapor, water and sediments) by clouds, waves, sea current, plumes of suspended sediments associated to river outlets, dunes, sediment sources and shore-line orientation. Author

N74-30769* Geological Survey of Alabama, University.
SIGNIFICANCE OF SELECTED LINEAMENTS IN ALABAMA
James A. Drahovzal, Thornton L. Neathery, and Charles C. Wielchowsky *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 897-918 refs (For availability see N74-30705 20-13)
(Paper-G24) CSCL 08F

Four lineaments in the Alabama Appalachians that appear on ERTS-1 imagery have been geologically analysed. Two of the lineaments appear to have regional geologic significance, showing relationships to structural and stratigraphic frameworks, water and mineral resources, geophysical anomalies, and seismicity. The other two lineaments are of local geologic significance, but, nevertheless, have important environmental implications. Author

N74-30770* Atomic Energy Establishment, Cairo (Egypt).
GEOLOGIC INTERPRETATION OF ERTS-1 SATELLITE IMAGES FOR WEST ASWAN AREA, EGYPT
E. M. ElShazly, M. A. Abdel-Hady (Oklahoma State Univ.), M. A. ElGhawaby, and I. A. ElKassas *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 919-942 refs (For availability see N74-30705 20-13)
(Paper-G25) CSCL 08G

ERTS-1 images of West Aswan area were interpreted in terms of geology, drainage, and structure. Twenty-two geological units were distinguished on ERTS-1 images in West Aswan area covering geological formations and erosional levels within some formations ranging from the Precambrian to the Quaternary. Apart from the distinction of Aswan monumental granite the investigated area shows very interesting exposures of sedimentary rocks ranging from the Cretaceous to the Quaternary. Of special interest is the delineation of the iron-ore member of the Nubian Sandstone and the phosphate-bearing formation. The tracing of the geological formations from south to north and the distinction of the varied geological units within the Pliocene and Quaternary, and the discussion on the origin of tufa are of particular significance. Also, the tracing on these images of major fractures and faults intercepting Aswan Dam Reservoir and their significance on the seepage and possible future development of diversion channels from reservoir is emphasized. Author

N74-30771* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ERTS: A MULTISPECTRAL IMAGE ANALYSIS CONTRIBUTION FOR THE GEOMORPHOLOGICAL EVALUATION OF SOUTHERN MARACAIBO LAKE BASIN
F. Salas, O. Cabello, F. Alarcon, and C. Ferrer *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 943-953 (For availability see N74-30705 20-13)
(Paper-G26) CSCL 08B

Multispectral analysis of ERTS-A images at scales of 1:1,000,000 and 1:500,000 has been conducted with conventional photointerpretation methods. Specific methods have been developed for the geomorphological analysis of southern Maracaibo Lake Basin which comprises part of the Venezuelan Andean Range, Perija Range, the Tachira gap and the Southern part of the Maracaibo Lake depression. A steplike analysis was conducted to separate macroforms, landscapes and relief units as well as drainage patterns and tectonic features, which permitted the delineation of tectonic provinces, stratigraphic units, geomorphologic units and geomorphologic positions. The geomorphologic synthesis obtained compares favorably with conventional analysis made on this area for accuracy of 1:100,000 scale, and in some features with details obtained through conventional analysis for accuracy of 1:15,000 and field work. Geomorphological units in the mountains were identified according to changes in tone, texture, forms orientation of interfluves and tectonic characteristics which control interfluvial disimetrics. Author

N74-30772* Bureau du President, Kinshasa (Zaire).
GEOLOGIC HYPOTHESES OF LAKE TANGANYIKA REGION, ZAIRE, DRAWN FROM ERTS IMAGERY
Ulyera Wolyce and Sendwe Ilunga *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 955-967 (For availability see N74-30705 20-13)
(Paper-G27) CSCL 08G

Based on initial work in the Lake Tanganyika area of eastern Zaire, it has been concluded that ERTS imagery is extremely useful for reconnaissance level geologic mapping and analysis in this region of the humid tropics. In particular, ERTS imagery has proven useful for recognizing and mapping regional structural units, for recognizing major structural features, and for arriving at some preliminary hypotheses about the mineral potential of the area. Results so far indicate that ERTS imagery can make a major contribution to the development of the mineral resources of the country. Research has concentrated on applications of ERTS imagery in the field of cartography, geology, forestry, hydrology and agriculture. For the work in geology, a test site was chosen in eastern Zaire on the shore of Lake Tanganyika in the vicinity of the Lukuga River. This area was selected because of its varied geology and the existence of two frames of cloud-free ERTS imagery. Author

N74-30773* Federal Geological Survey, Hanover (West Germany).
PRELIMINARY RESULTS OF ERTS-INVESTIGATIONS BY W-GERMAN INVESTIGATIONS
Richard Muehlfeld *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 969-976 (For availability see N74-30705 20-13)
(Paper-G28) CSCL 05B

Results are presented of West German investigations into multidisciplinary geoscientific experiments in central Germany and the Alps, and hydrogeological investigations in the Pampa of Argentina based on ERTS-1 data. The main goals of the investigation were achieved. The studies have given a good idea of the possibilities and limitations of ERTS imagery depending on the objectives in question and on the geographical conditions of the areas under investigation. Even in the well known region of central Europe, ERTS has proven its ability of improving present knowledge. In fields such as pollution monitoring and regional planning the satellite techniques should have distinct practical value. For any regional study of less known areas, the value of ERTS imagery can hardly be overestimated. Author

N74-30774*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THIRD EARTH RESOURCES TECHNOLOGY SATELLITE-1 SYMPOSIUM. VOLUME 1: TECHNICAL PRESENTATIONS, SECTION B
Stanley C. Freden, comp., Enrico P. Mercanti, comp., and Margaret A. Becker, comp. Washington 1974 936 p refs Symp. held at Washington, D. C., 10-14 Dec. 1973
(NASA-SP-351-Vol-1-Sect-B) Avail: NTIS MF $1.45; SOD HC $16.80 per set of sections A and B CSCL 05B

For Volume 1, Section A, see N74-30705. For individual titles, see N74-30775 through N74-30830.

N74-30775* Environmental Research and Technology, Inc., Lexington, Mass.
MAPPING SNOW EXTENT IN THE SALT-VERDE WATERSHED AND THE SOUTHERN SIERRA NEVADA USING ERTS IMAGERY
James C. Barnes, Clinton J. Bowley, and David A. Simmes *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 977-993 refs (For availability see N74-30774 20-13)
(Paper-W1) CSCL 08L

In much of the western United States a large part of the utilized water comes from accumulated mountain snowpacks; thus, accurate measurements of snow distributions are required for input to streamflow prediction models. The application of ERTS imagery for mapping snow has been evaluated for two geographic areas, the Salt-Verde Watershed in central Arizona and the southern Sierra Nevada in California. Techniques have been developed to identify snow and to differentiate between snow and cloud. The snow extent for these two drainage areas has been mapped from the MSS-5 (0.6-0.7 micron) imagery and compared with aerial survey snow charts, aircraft photography, and ground-based snow measurements. Author

N74-30776* National Environmental Satellite Service, Washington, D.C.
SNOW-EXTENT MAPPING AND LAKE ICE STUDIES USING ERTS-1 MSS TOGETHER WITH NOAA-2 VHRR
D. R. Wiesnet and D. F. McGinnis, Jr. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 995-1009 refs (For availability see N74-30774 20-13)
(Paper-W2) CSCL 08L

Five snow extent maps of the 5,601 sq km American River Basin were prepared using a Zoom Transfer Scope from ERTS-1 MSS band 4 imagery. The maps were generally completed within one hour. A snowmelt curve based on ERTS-1 imagery was used as a calibration standard or comparison for maps prepared from NOAA-2 VHRR imagery in the same manner. Cost comparisons with U-2 derived imagery indicate that ERTS-1 snow mapping of the basins is six times faster. Conservative estimates of comparable aircraft snow survey flights yields a cost figure 200 times that of the ERTS-1 snow map. Snow mapping attempts in the Lake Ontario Basin demonstrated that ERTS-1 is not well suited to large basins. Optimum size of basins for ERTS

studies is believed to range from about 250 sq km to 30,000 sq km. The value of the ERTS-1 MSS for Great Lake ice evaluation was proved during the past winter on Lake Erie. Not only were ice features and types of ice identified, but melting ice was detected through the combined use of band 5 and band 7. Ice movement (direction and speed) was mapped by examining imagery from two successive days. Author

N74-30777* Geological Survey, Reston, Va. Branch of International Activities Topographic Div.
NEW SPACE TECHNOLOGY ADVANCES KNOWLEDGE OF THE REMOTE POLAR REGIONS
William R. MacDonald *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1011-1022 ref (For availability see N74-30774 20-13)
(Paper-W3) CSCL 08L

The application of ERTS-1 imagery is rapidly increasing man's knowledge of polar regions. Products compiled from this imagery at scales of 1:250,000, 1:500,000 and 1:1,000,000 are already providing valuable information to earth scientists working in Antarctica. Significant finds detected by these bench mark products were glaciological changes, advancement in ice fronts, discovery of new geographic features, and the repositioning of nunataks, islands, and ice tongues. Tests conducted in Antarctica have proven the feasibility of tracking Navy navigation satellites to establish ground control for positioning ERTS-1 imagery in remote areas. ERTS imagery coupled with satellite geodesy shows great promise and may prove to be the most practical and cost effective way to meet the small-scale cartographic requirements of the polar science community. Author

N74-30778* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ERTS-1 DATA IN SUPPORT OF THE NATIONAL PROGRAM OF INSPECTION OF DAMS
G. E. Graybeal, F. G. Hall, B. H. Moore (Lockheed Electronics Co., Inc., Houston, Tex.), and E. H. Schlosser (Lockheed Electronics Co., Inc., Houston, Tex.) *In its* 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1023-1039 refs (For availability see N74-30774 20-13)
(Paper-W4) CSCL 08H

A computer-aided procedure, for use in the detection and location of areas of surface water, has been developed. The procedure was developed in support of the National Program of Inspection of Dams established by Public Law 92-367. The procedure utilizes data acquired by the unmanned Earth Resources Technology Satellite in conjunction with ancillary data in the form of topographic and highway maps, and meteorological data summaries. The procedure is divided into several distinct phases. A five-volume manual has been prepared to instruct potential users of the procedure. Author

N74-30779* Texas Technological Univ., Lubbock.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS
C. C. Reeves, Jr. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1041-1069 refs (For availability see N74-30774 20-13)
(Paper-W5) CSCL 08H

Three small playa lake basins on the Texas High Plains were originally selected as ERTS-1 test sites to attempt correlation of ERTS-1 imagery with the water balance ecosystem and geology/morphology of the lake basins. The 5-mile long large Double Lakes playa complex was also instrumented as an alternate test site. Analysis of bands 6 and 7 of ERTS-1 MSS imagery shows that lake basins as small as 200 m in diameter (+ or - 10 acres) can be reliably classified as being wet or dry, thus supplying the methodology for a rapid, periodic census of surface water. A cost/benefit analysis reveals that the use of MSS imagery for such a census results in a 66 to 200-fold cost reduction when compared to the costs of using other conventional methods. Author

N74-30780* Geological Survey, Miami, Fla.
WATER-MANAGEMENT MODELS IN FLORIDA FROM ERTS-1 DATA
Aaron L. Higer, Alfred E. Coker, and Edwin H. Cordes *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1071-1088 refs (For availability see N74-30774 20-13)
CSCL 08H

A prototype multiparameter data acquisition network, installed and operated by the U.S. Geological Survey is a viable approach for obtaining near real-time data needed to solve hydrologic problems confronting nearly 2.5 million residents of south Florida. Selected water quantity and quality data obtained from ground stations are transmitted for relay via ERTS-1 to NASA receiving stations in virtual real time. This data relay system has been very reliable and, by coupling the ground information with ERTS imagery, a modeling technique is available for water resource management in south Florida. An ecological model has been designed for the Shark River Slough in Everglades National Park. Author

N74-30781* Agricultural Research Service, Chickasha, Okla.
MEASURING WATERSHED RUNOFF CAPABILITY WITH ERTS DATA
Bruce J. Blanchard *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1089-1098 ref (For availability see N74-30774 20-13)
(Paper-W7) CSCL 08H

Parameters of most equations used to predict runoff from an ungaged area are based on characteristics of the watershed and subject to the biases of a hydrologist. Digital multispectral scanner, MSS, data from ERTS was reduced with the aid of computer programs and a Dicomed display. Multivariate analyses of the MSS data indicate that discrimination between watersheds with different runoff capabilities is possible using ERTS data. Differences between two visible bands of MSS data can be used to more accurately evaluate the parameters than present subjective methods, thus reducing construction cost due to overdesign of flood detention structures. Author

N74-30782* Geological Survey, Harrisburg, Pa.
AN EVALUATION OF THE ERTS DATA COLLECTION SYSTEM AS A POTENTIAL OPERATIONAL TOOL
Richard W. Paulson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1099-1111 refs (For availability see N74-30774 20-13)
CSCL 05B

The Earth Resources Technology Satellite Data Collection System has been shown to be, from the users vantage point, a reliable and simple system for collecting data from U.S. Geological Survey operational field instrumentation. It is technically feasible to expand the ERTS system into an operational polar-orbiting data collection system to gather data from the Geological Survey's Hydrologic Data Network. This could permit more efficient internal management of the Network, and could enable the Geological Survey to make data available to cooperating agencies in near-real time. The Geological Survey is conducting an analysis of the costs and benefits of satellite data-relay systems. Author

N74-30783* Department of the Environment, Ottawa (Ontario).
RETRANSMISSION OF WATER RESOURCES DATA USING THE ERTS-1 DATA COLLECTION SYSTEM
R. A. Halliday, I. A. Reid, and E. F. Chapman *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1113-1126 refs (For availability see N74-30774 20-13)
(Paper-W9) CSCL 08H

The Water Survey of Canada operates a network of approximately 2400 gauging stations at which water level data are collected. Nine DCPs were installed in isolated areas of northern and western Canada. It was felt that DCPs in these locations would be exposed to climatic conditions severe enough to provide a check on system reliability. Water level data are transmitted from all sites and, also, some of the DCPs are used to transmit ice break-up, water velocity, precipitation, air temperature, water stage recorder clock operation or DCP battery voltage. Consideration is being given to transmitting other parameters that would be of value in flood or flow forecasting. Results of the project have been excellent. There has been no data loss that can be attributed to failure of a DCP although data were lost because of sensor malfunctions. The quality of data collected compares favourably with that of the hard record obtained at the remote sites. Costs of using the ERTS Data Collection System are reasonable. Author

N74-30784* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ERTS-1 FLOOD HAZARD STUDIES IN THE MISSISSIPPI RIVER BASIN
Albert Rango and Arthur T. Anderson *In its* 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1127-1166 refs (For availability see N74-30774 20-13)
(Paper-W10) CSCL 08H

The Spring 1973 Mississippi River flood was investigated using remotely sensed data from ERTS-1. Both manual and automatic analyses of the data indicate that ERTS-1 is extremely useful as a regional tool for flood and floodplain management. The maximum error of such flood area measurements is conservatively estimated to be less than five percent. Change detection analysis indicates that the flood had major impacts on soil moisture, land pattern stability, and vegetation stress. Flood hazard identification was conducted using photointerpretation techniques in three study areas along the Mississippi River using pre-flood ERTS-1 imagery down to 1:100,000 scale. Flood prone area boundaries obtained from ERTS-1 were generally in agreement with flood hazard maps produced by the U.S. Army Corps of Engineers and the U.S. Geological Survey although the latter are somewhat more detailed because of their larger scale. Initial results indicate that ERTS-1 digital mapping of the flood-prone areas can be performed at least 1:62,500 which is comparable to conventional flood hazard map scales. Author

N74-30785* Geological Survey, Washington, D.C.
OPTICAL DATA PROCESSING AND PROJECTED APPLICATIONS OF THE ERTS-1 IMAGERY COVERING THE 1973 MISSISSIPPI RIVER VALLEY FLOODS
Morris Deutsch and F. H. Ruggles *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1167-1188 refs (For availability see N74-30774 20-13)
(Paper-W11) CSCL 08H

Flooding along the Mississippi River and some of its tributaries was imaged by the multispectral scanner (MSS) on the Earth Resources Technology Satellite (ERTS-1) on at least three orbits during the spring of 1973. The ERTS data provided the first opportunity for mapping the regional extent of flooding at the time the imagery was acquired. Special optical data processing techniques were used to produce a variety of multispectral color composites which enhanced floodplain details. One of these, a two-color composite of near infrared bands 6 and 7, was enlarged and registered to 1:250,000-scale topographic maps and used as the basis for preparation of flood image maps. Two specially filtered three-color composites of MSS bands 5, 6, and 7 and 4, 5, and 7 were prepared to aid in the interpretation of the data. The extent of the flooding was vividly depicted on a single image by two-color temporal composites produced on the additive-color viewer using band 7 flood data superimposed on pre-flood band 7 images. Analysis of temporal data composites of the pre-flood and post-flood band 7 images indicate that changes in surface reflectance characteristics caused by the flooding can be delineated, thus making it possible to map the overall area flooded without the necessity of a real-time system to track and image the peak flood waves. Author

N74-30786* Vermont Univ., Burlington.
APPLICATION OF ERTS IMAGERY TO ENVIRONMENTAL STUDIES OF LAKE CHAMPLAIN
A. O. Lind *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1189-1196 refs (For availability see N74-30774 20-13)
(Paper-W12) CSCL 08H

ERTS Imagery has provided data relating to a number of environmental and limnological concerns such as water quality, lake flooding and lake ice formation. Pollution plume data provided by ERTS was recently used in the Supreme Court case involving the States of Vermont and New York and a paper company. Flooding of lowland tracts has been a major concern due to a repetitive pattern of high lake levels over the past three years, and ERTS imagery is being used to construct the first series of flood maps of the affected areas. Lake ice development and turbidity patterns have also been studied from ERTS, since these have significance for shore erosion studies. Author

N74-30787* Corps of Engineers, Waltham, Mass.
A REAL TIME DATA ACQUISITION SYSTEM BY SATELLITE RELAY
Saul Cooper *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1197-1212 (For availability see N74-30774 20-13)
(Paper-W13) CSCL 08H

The overall aim was to evaluate the future usefulness of satellites in the performance of coordination and management functions related to the operation of flood control and other multipurpose projects in New England. Results on the data collection portion of the work are presented. The principal task was to develop statistics that demonstrate the relationship between conventional means of acquiring hydrologic data and the contribution made by using the satellite and its data collection platforms. Main interest was in determining the availability, reliability and usability of the data. Significant results on DCS show that the DCP's are reliable and useful and satellite data collection appears feasible on a nationwide basis. Author

N74-30788* Geological Survey, Phoenix, Ariz.
HYDROLOGIC APPLICATIONS OF ERTS-1 DATA COLLECTION SYSTEM IN CENTRAL ARIZONA
Herbert H. Schumann *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1213-1223 (For availability see N74-30774 20-13)
(Paper-W14) CSCL 08H

The Earth Resources Technology Satellite (ERTS-1) Data Collection System (DCS) was used to relay hydrologic data (streamflow rates, precipitation amounts, soil and air temperature, and snow-moisture content) from remote sites in central Arizona to those responsible for reservoir management. The ERTS-DCS was utilized to furnish near-real time information on snow-moisture content and streamflow rates to the Salt River Project for use in the management and operation of reservoirs on the Salt and Verde Rivers. The Salt River Project, aided by near-real time hydrologic data furnished by both microwave and ERTS-telemetry, was successful in predicting the volume of runoff into the reservoirs. Serious flooding in the downstream Phoenix metropolitan area was prevented by prudent water management. Author

N74-30789* American Univ., Washington, D.C. Dept. of Biology.
APPLICATIONS OF ERTS DATA TO COASTAL WETLAND ECOLOGY WITH SPECIAL REFERENCE TO PLANT COMMUNITY MAPPING AND TYPING AND IMPACT OF MAN
Richard R. Anderson, Virginia Carter, and John McGinness *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1225-1242 refs (For availability see N74-30774 20-13)
(Paper-W15) CSCL 08H

Complete seasonal ERTS-1 coverage of Atlantic coastal wetlands from Delaware Bay to Georgia provides a basis for assessment of temporal data for wetland mapping, evaluation, and monitoring. Both MSS imagery and digital data have proved useful for gross wetland species delineation and determination of the upper wetland boundary. Tidal effects and (band to band or seasonal) spectral reflectance differences make it possible to type vegetatively coastal wetlands in salinity related categories. Management areas, spoil disposal sites, drainage ditches, lagoon-type developments and highway construction can be detected indicating a monitoring potential for the future. A northern test site (Maryland-Virginia) and a southern test site (Georgia-South Carolina), representing a range of coastal marshes from saline to fresh, were chosen for intensive study. Wetland maps were produced at various scales using both ERTS imagery (bands 5 and 7) and digital data (bands 4, 5 and 7). Author

N74-30790* Delaware Univ., Newark. Coll. of Marine Studies.
INVENTORIES OF DELAWARE'S COASTAL VEGETATION AND LAND-USE UTILIZING DIGITAL PROCESSING OF ERTS-1 IMAGERY
V. Klemas, D. Bartlett, R. Rogers (Bendix Corp., Ann Arbor), and L. Reed (Bendix Corp., Ann Arbor) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1243-1255 refs (For availability see N74-30774 20-13)
(Paper-W16) CSCL 08H

Digital analysis of ERTS-1 imagery was used in an attempt to map and inventory the significant ecological communities of Delaware's coastal zone. Eight vegetation and land use discrimination classes were selected: (1) phragmites communis (Giant Reed grass); (2) spartina alterniflora (Salt marsh cord grass); (3) spartina patens (Salt marsh hay); (4) shallow water and exposed mud; (5) deep water (2 meters); (6) forest; (7) agriculture; and (8) exposed sand and concrete. Canonical analysis showed that classification accuracy was quite good with spartina alterniflora, exposed sand-concrete, and forested land - all discriminated with between 94% and 100% accuracy. The shallow water-mud and deep water categories were classified with accuracies of 88% and 93% respectively. Phragmites communis showed a classification accuracy of 83% with all confusion occurring with spartina patens which may be due to use of mixed stands of these species as training sets. Discrimination of spartina patens was very poor (accuracy 52%). Author

N74-30791* National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
EVALUATION OF REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS
Robert H. Cartmill *In its* 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1257-1277 refs (For availability see N74-30774 20-13)
(Paper-W17) CSCL 08H

This investigation has been conducted in the Atchafalaya River Basin of South Central Louisiana. This is a humid area of heavily forested swamps with a large volume of flow mostly from a diversion of the lower Mississippi River. Techniques to obtain enlarged imagery from computer compatible tapes of ERTS data without photographic enlargement is explained and illustrated. Techniques of extraction of environmental information from single bands and multiband pattern recognition procedures are explained and evaluated. A comparison of pattern recognition classifications of the Atchafalaya Basin by aircraft multispectral scanner and ERTS MSS data is made. Data for this comparison were gathered within three weeks of each other in the winter of 1973. Scorecards of the accuracy of the classifications are presented. Recommendations are made concerning the utilization of each sensor platform to perform specific tasks of wetlands characterization. Author

N74-30792* National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
RELATIONSHIPS BETWEEN ERTS RADIANCES AND GRADIENTS ACROSS OCEAN FRONTS
George A. Maul and Howard R. Gordon (Miami Univ., Coral Gables) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1279-1308 refs (For availability see N74-30774 20-13)
(NASA Order S-70246-AG)
(Paper-M1) CSCL 08C

A time series of the Loop Current in the Gulf of Mexico, covering an annual cycle of growth, spreading, and decay, has been obtained in synchronization with ERTS. Computer enhanced images, which are necessary to extract useful oceanic information, show that the current can be observed either by color or sea state effects associated with the cyclonic boundary. The color effect relates to the spectral variations in the optical properties of the water and its suspended particles, and is studied by radiative transfer theory. Significant oceanic parameters identified are: the probability of forward scattering, and the ratio of scattering to total attenuation. Author

N74-30793* National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
OCEAN INTERNAL WAVES OFF THE NORTH AMERICAN AND AFRICAN COASTS FROM ERTS-1
John R. Apel and Robert L. Charnell *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1309-1316 (For availability see N74-30774 20-13)
(Paper-M2) CSCL 08C

Periodic features observed in the ocean portions of certain ERTS-1 images have been identified with reasonable certainty as surface manifestations of oceanic internal gravity waves. A series of images taken over the New York Bight, commencing with the 16 July 1972 overpass and continuing on into autumn of 1973, has shown the internal waves to be present when summer solar heating stratifies the water sufficiently well to support such oscillations. When fall and winter wind action mixes the shelf water down to the bottom, the waves no longer appear. In the Bight, the wavelengths range from approximately 400 to 1000 m, with the wave field being most sharply delineated near the edges of the continental shelf, at the mouth of the Hudson Canyon. They appear in packets consisting of several waves separated by 10-15 km, which propagate up on the shelf and disappear. Author

N74-30794* National Marine Fisheries Service, Bay Saint Louis, Miss.
A REVIEW OF INITIAL INVESTIGATIONS TO UTILIZE ERTS-1 DATA IN DETERMINING THE AVAILABILITY AND DISTRIBUTION OF LIVING MARINE RESOURCES
William H. Stevenson, Andrew J. Kemmerer, Buddy H. Atwell (NASA. Mississippi Test Facility), and Paul M. Maughan (Earth Satellite Corp.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1317-1331 refs (For availability see N74-30774 20-13)
(Paper-M3) CSCL 08A

This study was initiated in July 1972 to determine the reliability of satellite and high altitude sensors to provide data about oceanographic parameters in coastal waters; demonstrate the use of remotely sensed oceanographic information to predict the distribution and abundance of adult menhaden; and, demonstrate the potential of using satellite acquired information for improving the harvest and management of a fishery resource. The study focused on coastal are as in the north central portion of the Gulf of Mexico including parts of Alabama, Mississippi and Louisiana. The area used in the final analysis was limited to the Mississippi Sound, which is approximately 145 kilometers (90 miles) long and 16 kilometers (10 miles) wide, has an average water depth of about 3.7 meters (12 feet), and in general characterizes an estuarine environment. Author

N74-30795* Environmental Research Inst. of Michigan, Ann Arbor.
UPDATING COASTAL AND NAVIGATIONAL CHARTS USING ERTS-1 DATA
Fabian C. Polcyn and David R. Lyzenga *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1333-1346 refs (For availability see N74-30774 20-13)
(Paper-M4) CSCL 08B

A successful processing algorithm for extracting water depth information from ERTS data has been developed. Depth charts for two geographical areas have been constructed representing different solar illumination and water transparency conditions. Absolute depth calculations for water depth to 4.5 fathoms have been demonstrated for the Little Bahama Bank. Depth Charts also were constructed using data in Band 4 and 5 of the ERTS-1 MSS for areas in Lake Michigan. This data represented a low sun angle, poor light transmission in water conditions and gave useful results to 200 meters. In both cases, the ERTS map represented an update in shallow water detail in comparison with available navigation charts for the areas tested. Present processing costs to provide MSS depth charts are estimated to be on the order of $1.50 per sq. mile. The updating of navigation charts for areas hazardous to shipping is an achievable direct application. Author

N74-30796* Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Systems Div.
SEDIMENT CONCENTRATION MAPPING IN TIDAL ESTUARIES
A. N. Williamson and W. E. Grabau *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1347-1386 ref (For availability see N74-30774 20-13)
(Paper-M5) CSCL 08B

An analytical procedure has been developed that considers the ERTS-1 multispectral scanner as a reflectance spectrophotometer. ADP techniques requiring only very limited computer capability are utilized to search the data defining the spectral reflectance characteristics of a scene on a pixel-by-pixel basis, identify each pixel whose spectral reflectance matches a reference spectrum, and generate maps that identify pixel locations where spectrum matches occur and identify the spectrum that was matched. If the reference spectra are known to represent a specific

condition on the ground, a map of the distribution of that condition can be output as a dimensionally accurate overlay to maps of any selected scale. Two applications are described: (1) mapping the distribution of water masses exhibiting specific suspended sediment concentrations; and (2) determining the location and delineation of surface water bodies in the southeastern U. S. The techniques described are being successfully used to map the land area inundated by the 1973 spring flood in the Lower Mississippi River Valley, map sediment distributions in Lake Pontchartrain (in Louisiana) as a result of opening the Bonnet Carre Floodway during the spring flood, and inventory lakes and reservoirs. Author

N74-30797* Delaware Univ., Newark.
MONITORING COASTAL WATER PROPERTIES AND CURRENT CIRCULATION WITH ERTS-1
V. Klemas, M. Otley, C. Wethe, and R. Rogers (Bendix Corp., Ann Arbor) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1387-1411 refs (For availability see N74-30774 20-13)
(Paper-M6) CSCL 08C

Imagery and digital tapes from nine successful ERTS-1 passes over Delaware Bay during different portions of the tidal cycle have been analyzed with special emphasis on turbidity, current circulation, waste disposal plumes and convergent boundaries between different water masses. ERTS-1 image radiance correlated well with Secchi depth and suspended sediment concentration. Circulation patterns observed by ERTS-1 during different parts of the tidal cycle, agreed well with predicted and measured currents throughout Delaware Bay. Convergent shear boundaries between different water masses were observed from ERTS-1. In several ERTS-1 frames, waste disposal plumes have been detected 36 miles off Delaware's Atlantic coast. The ERTS-1 results are being used to extend and verify hydrodynamic models of the bay, developed for predicting oil slick movement and estimating sediment transport. Author

N74-30798* Corps of Engineers, San Francisco, Calif.
CALIFORNIA COASTAL PROCESSES STUDY
Douglas M. Pirie and David D. Steller (Geosource Intern., Inc.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1413-1466 refs (For availability see N74-30774 20-13)
(Paper-M7) CSCL 08C

Preliminary findings are presented and applications derived from ERTS-1 satellite imagery of the nearshore coastal processes of the California coast. The objectives were to analyze nearshore currents, sediment transport, and estuarine and river discharges along the California coast through the use of synoptic and repetitive imagery from ERTS as well as aircraft underflights and surface data. The major conclusions are: (1) Distinct seasonal patterns for sediment transport as a function of the oceanic current systems and coastal morphology have been identified. (2) Large scale sediment plumes from intermittent streams and rivers extend offshore to previously unanticipated ranges. (3) Computer generated contouring of radiance levels from computer-compatible tapes result in charts that can be used for determination of surface and nearsurface suspended sediment distribution. (4) Flying spot scanner enhancements result in details of nearshore features. (5) Data is providing significant information for coastal planning and construction projects. Author

N74-30799* Institut Geographique National, Hann-Dakar (Senegal).
THE UTILIZATION OF ERTS-1 DATA FOR THE STUDY OF THE FRENCH ATLANTIC LITTORAL
Pierre G. Demathieu and Fernand H. Verger (Lab. de Geomorphologie, Paris) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1447-1450 (For availability see N74-30774 20-13)
(Paper-M8) CSCL 08C

The French Atlantic Littoral (FRALIT) program uses ERTS-1 data to study coastal geomorphology and waters. ERTS-1 gives an overall picture of the phenomena for the first time due mainly to channel 4 data, but the other channels also contribute valuable complementary data on superficial waters. These studies have already resulted in accurate maps of the mud transported south-westwards from the mouth of the River Loire. Author

N74-30800* Alaska Univ., Anchorage.
ERTS IMAGERY APPLIED TO ALASKAN COASTAL PROBLEMS
F. F. Wright, G. D. Sharma, D. C. Burbank, and J. J. Burns (Alaska Dept. of Fish and Game) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1451 (For availability see N74-30774 20-13)
(Paper-M9) CSCL 08C

Along the Alaska coast, surface water circulation is relatively easy to study with ERTS imagery. Highly turbid river water, sea ice, and fluvial ice have proven to be excellent tracers of the surface waters. Sea truth studies in the Gulf of Alaska, Cook Inlet, Bristol Bay, and the Bering Strait area have established the reliability of these tracers. ERTS imagery in the MSS 4 and 5 bands is particularly useful for observing lower concentrations of suspended sediment, while MSS 6 data is best for the most concentrated plumes. Ice features are most clearly seen on MSS 7 imagery; fracture patterns and the movement of specific floes can be used to map circulation in the winter when runoff is restricted, if appropriate allowance is made for wind influence. Current patterns interpreted from satellite data are only two-dimensional, but since most biological activity and pollution are concentrated near the surface, the information developed can be of direct utility. Details of Alaska inshore circulation of importance to coastal engineering, navigation, pollution studies, and fisheries development have been clarified with satellite data. ERTS has made possible the analysis of circulation in many parts of the Alaskan coast. Author

N74-30801* Environmental Research and Technology, Inc., Lexington, Mass.
MONITORING ARCTIC SEA ICE USING ERTS IMAGERY
James C. Barnes and Clinton J. Bowley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1453-1465 refs (For availability see N74-30774 20-13)
(Paper-M10) CSCL 08L

Because of the effect of sea ice on the heat balance of the Arctic and because of the expanding economic interest in arctic oil and other minerals, extensive monitoring and further study of sea ice is required. The application of ERTS data for mapping ice is evaluated for several arctic areas, including the Bering Sea, the eastern Beaufort Sea, parts of the Canadian Archipelago, and the Greenland Sea. Interpretive techniques are discussed, and the scales and types of ice features that can be detected are described. For the Bering Sea, a sample of ERTS imagery is compared with visual ice reports and aerial photography from the NASA CV-990 aircraft. Author

N74-30802* RAND Corp., Santa Monica, Calif.
APPLICABILITY OF ERTS TO ANTARCTIC ICEBERG RESOURCES
John L. Hult and Neill C. Ostrander *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1467-1490 refs (For availability see N74-30774 20-13)
(Paper-M11; R-1354-NASA/NSF) CSCL 08L

This investigation explores the applicability of ERTS to: (1) determine the Antarctic sea ice and environmental behavior that may influence the harvesting of icebergs, and (2) monitor iceberg locations, characteristics, and evolution. Imagery sampling in the western Antarctic between the Peninsula and the Ross Sea is used in the analysis. It is found that the potential applicability of ERTS to the research, planning, and harvesting operations can contribute importantly to the glowing promise derived from broader scope studies for the use of Antarctic icebergs to relieve a growing global thirst for fresh water. Several years of comprehensive monitoring will be necessary to characterize sea-ice and environmental behavior and iceberg evolution. Live ERTS services will assist harvesting control and claiming operations and offer a means for harmonizing entitlements to iceberg resources. Author

N74-30803* Wisconsin Univ., Milwaukee. Coll. of Engineering and Applied Science.
THE USE OF ERTS-1 IMAGERY IN AIR POLLUTION AND MESOMETEOROLOGICAL STUDIES AROUND THE GREAT LAKES c20
Walter A. Lyons and Richard A. Northouse *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974

p 1491-1504 refs Sponsored in part by NASA (For availability see N74-30774 20-13)
(Grants EPA-R800873; NSF GA-32208)
(Paper-E1) CSCL 04B

ERTS-1 images continue to be highly useful in studies of: (1) long range transport of air pollutants over the Great Lakes; (2) the mesoscale atmospheric dynamics associated with episodic levels of photochemical smog along the western shore of Lake Michigan; and (3) inadvertant weather modification by large industrial complexes. Also unusual wave patterns in fogs and low stratus over the Great Lakes are being detected for the first time due to the satellites high resolution. Author

N74-30804* Science Applications, Inc., La Jolla, Calif.
A METHOD TO MEASURE THE ATMOSPHERIC AEROSOL CONTENT USING ERTS-1 DATA c20
Michael Griggs *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1505-1517 refs (For availability see N74-30774 20-13)
(Paper-E2) CSCL 04B

The apparent gradual increase of particles in the atmosphere has received considerable attention in recent years due to the possible effect of atmospheric aerosols on the earth's climate. The ERTS-1 satellite offered the opportunity of determining the feasibility of monitoring the atmospheric aerosol content on a global basis, as suggested by theoretical studies, which showed a linear relationship between the upwelling earth atmosphere radiance and the aerosol content. This relationship was investigated at two test sites, San Diego and the Salton Sea, using the MSS radiance data, with ground truth observations of the aerosol content being made with a Volz photometer at the time of the satellite overpasses. Significant results, relating the radiance over water surfaces to the atmospheric aerosol content, have been obtained. The results indicate that the MSS channels, 4, 5 and 6 centered at 0.55, 0.65 and 0.75 micron have comparable sensitivity, and that the aerosol content can be determined within + or - 10% with the assumed measurement errors of the MSS. Author

N74-30805* Bendix Corp., Ann Arbor, Mich. Aerospace systems Div.
AUTOMATED STRIP-MINE AND RECLAMATION MAPPING FROM ERTS
Robert H. Rogers, Larry E. Reed, and Wayne A. Pettyjohn (Ohio State Univ.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1519-1531 (For availability see N74-30774 20-13)
(Paper-E3) CSCL 08I

Using computer processing techniques, it is possible to produce geometrically-corrected maps of the coal strip mines in East-Central Ohio by utilizing ERTS-1 CCTs. Several target categories can be drawn by a computer-controlled pen on film that will accurately overlay a base map of any scale selected by the operator. For each overlay, the computer can generate a table that shows the area of each target category in square kilometers, acres, or percent of total area. Author

N74-30806* Ohio Dept. of Economic and Community Development, Columbus.
SIGNIFICANT APPLICATIONS OF ERTS-1 DATA TO RESOURCE MANAGEMENT ACTIVITIES AT THE STATE LEVEL IN OHIO
David C. Sweet, P. G. Pincura, C. J. Meier (Dept. of Natural Resources), G. B. Garrett (Ohio EPA), L. Herd (DOT, State Government of Ohio), G. E. Wukelic (Battelle Columbus Labs., Ohio), J. G. Stephan (Battelle Columbus Labs., Ohio), and H. E. Small (Battelle Columbus Labs., Ohio) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1533-1555 refs (For availability see N74-30774 20-13)
(Paper-E4) CSCL 08F

Described are techniques utilized and the progress made in applying ERTS-1 data to (1) detecting, inventorying, and monitoring surface mining activities, particularly in relation to recently passed strip mine legislation in Ohio; (2) updating current land use maps at various scales for multiagency usage, and (3) solving other real-time problems existing throughout the various Ohio governmental agencies. General conclusions regarding current user views as to the opportunities and limitations of operationally using ERTS-1 data at the state level are also noted. Author

N74-30807* Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).
ERTS IMAGERY AS A SOURCE OF ENVIRONMENTAL INFORMATION FOR SOUTHERN AFRICA
Douglas T. Williamson and Brian Gilbertson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1559-1567 refs (For availability see N74-30774 20-13)
(Paper-E5) CSCL 08B

Southern Africa is faced with a variety of environmental problems that reflect the different states of development of countries in the region. The task of the environmental planner is in many instances complicated by a lack of basic resource information. The acquisition of the necessary data is often impeded by shortage of trained personnel and lack of funds, particularly in developing nations of the region. The range of environmental problems in Southern Africa are described and specific examples are shown of how ERTS type imagery can materially assist in solving these problems. These examples demonstrate that ERTS type data will be of substantial value to both the industrialized and the developing nations of Southern Africa, provided that problems of availability and user education are overcome. Author

N74-30808* Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).
APPLICATION OF ERTS IMAGERY IN ESTIMATING THE ENVIRONMENTAL IMPACT OF A FREEWAY THROUGH THE KNYSNA AREA OF SOUTH AFRICA
Douglas T. Williamson and Brian Gilbertson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1569-1573 (For availability see N74-30774 20-13)
(Paper-E6) CSCL 13B

In the coastal areas north-east and south-west of Knysna, South Africa lie natural forests, lakes and lagoons highly regarded by many for their aesthetic and ecological richness. A freeway construction project has given rise to fears of the degradation or destruction of these natural features. The possibility was investigated of using ERTS imagery to estimate the environmental impact of the freeway and found that: (1) All threatened features could readily be identified on the imagery. (2) It was possible within a short time to provide an area estimate of damage to indigenous forest. (3) In several important respects the imagery has advantages over maps and aerial photos for this type of work. (4) The imagery will enable monitoring of the actual environmental impact of the freeway when completed. Author

N74-30809* Army Cold Regions Research and Engineering Lab., Hanover, N.H.
APPLICATIONS OF ERTS-1 IMAGERY TO TERRESTRIAL AND MARINE ENVIRONMENTAL ANALYSES IN ALASKA
D. M. Anderson, H. L. McKim, W. K. Crowder, R. K. Haugen, L. W. Gatto, and T. L. Marlar *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1575-1606 refs (For availability see N74-30774 20-13)
(Paper-E7) CSCL 08F

ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. It also will aid local fishing industries by augmenting currently available hydrologic and navigation charts. The interpretation of geologic and vegetation features resulted in preparation of improved surficial geology, vegetation and permafrost terrain maps at a scale of 1:1 million utilizing ERTS-1 band 7 imagery. This information will be further utilized in a route and site selection study for the Nome to Kobuk Road in central Alaska. Large river icings along the proposed Alaska pipeline route have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska has been measured and shorefast ice accumulation and ablation along the west coast of Alaska is being mapped for the spring and early summer seasons. These data will be used for route and site selection, regional environmental analysis, identification and inventory of natural resources, land use planning, and in land use regulation and management. Author

N74-30810* Long Island Univ., Greenvale, N.Y.
AN INTERDISCIPLINARY STUDY OF THE ESTAURINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS
Edward Yost, R. Hollman, J. Alexander, and R. Nuzzi *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1607-1618 ref (For availability see N74-30774 20-13)
(Paper-E8) CSCL 08J

ERTS-1 photographic data products have been analyzed using additive color viewing and electronic image analysis techniques. Satellite data were compared to water sample data collected simultaneously with the data of ERTS-1 coverage in New York Bight. Prediction of the absolute value of total suspended particles can be made using composites of positives of MSS bands 5 and 6 which have been precisely made using the step wedge supplied on the imagery. Predictions of the relative value of the extinction coefficient can be made using bands 4 and 5. Thematic charts of total suspended particles (particles per litre) and extinction coefficient provide scientists conducting state and federal water sampling programs in New York Bight with data which improves the performance of these programs. Author

N74-30811* Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
AIRCRAFT AND SATELLITE MONITORING OF WATER QUALITY IN LAKE SUPERIOR NEAR DULUTH
James P Scherz, Michael Sydor (Minn. Univ., Duluth), and John F. VanDomelen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1619-1636 refs (For availability see N74-30774 20-13)
(Paper-E9) CSCL 08H

Satellite images and low altitude aerial photographs often show vivid discolorations in water bodies. Extensive laboratory analysis shows that water reflectance, which causes brightness on aerial images, positively correlates to the water quality parameter of turbidity, which on a particular day correlates to suspended solids. Work with low altitude photography on three overcast days and with ERTS images on five clear days provides positive correlation of image brightness to the high turbidity and solids which are present in Lake Superior near Duluth over 50% of the time. Proper use of aerial images would have shown that an $8,000,000 drinking water intake constructed in the midst of this unpotable, turbid water should have been located 6 miles north in clear, usable water. Noise effects such as skylight reflection, atmospheric effects, and depth penetration also must be understood for operational use of remote sensing for water quality monitoring and are considered in the paper. Author

N74-30812* Kansas Univ., Lawrence.
QUANTITATIVE WATER QUALITY WITH ERTS-1
Harold L. Yarger, James R. McCauley, Gerard W. James, Larry M. Magnuson, and G. Richard Marzolf (Kansas State Univ.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1637-1651 refs (For availability see N74-30774 20-13)
(Contract NAS5-21822)
(Paper-E10) CSCL 08H

Analyses of ERTS-1 MSS computer compatible tapes of reservoir scenes in Kansas along with ground truth show that MSS bands and band ratios can be used for reliable prediction of suspended loads up to at least 900 ppm. The major reservoirs in Kansas, as well as in other Great Plains states, are playing increasingly important roles in flood control, recreation, agriculture, and urban water supply. Satellite imagery is proving useful for acquiring timely low cost water quality data required for optimum management of these fresh water resources. Author

N74-30813* Philco-Ford Corp., Philadelphia, Pa.
AN EVALUATION OF THE USE OF ERTS-1 SATELLITE IMAGERY FOR GRIZZLY BEAR HABITAT ANALYSIS c04
Joel R. Varney, John J. Craighead (Mont. Univ., Missoula), and Jay S. Sumner (Mont. Univ., Missoula) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1653-1670 refs (For availability see N74-30774 20-13)
(Grant NGR-27-002-006)
(Paper-E11) CSCL 06C

Improved classification and mapping of grizzly habitat will permit better estimates of population density and distribution, and allow accurate evaluation of the potential effects of changes in land use, hunting regulation, and management policies on existing populations. Methods of identifying favorable habitat from ERTS-1 multispectral scanner imagery were investigated and described. This technique could reduce the time and effort required to classify large wilderness areas in the Western United States. Author

N74-30814* Environmental Research Inst. of Michigan, Ann Arbor.
UTILITY OF ERTS FOR MONITORING THE BREEDING HABITAT OF MIGRATORY WATERFOWL c04
Edgar A. Work, Jr., David S. Gilmer (Northern Prairie Wildlife Res. Center), and A. T. Klett (Northern Prairie Wildlife Res. Center) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1671-1686 refs (For availability see N74-30774 20-13)
(Paper-E12) CSCL 06C

Since 1968 the Bureau of Sport Fisheries and Wildlife (BSF&W) and the Environmental Research Institute of Michigan have cooperated on developing applications of remote sensing to the management of migratory waterfowl. Basically, this work has been concerned with (1) the assimilation of data on surface water conditions so that the data can be used as an index of annual waterfowl production, and (2) the collection of data on land use and wetland quality so that a measure of habitat carrying capacity is obtained. To date, efforts have been directed toward utilizing ERTS to monitor surface water conditions. An example of a model used for predicting the annual production of mallards (Anas platyrhynchos) is presented. The data inputs to this model and the potential for acquiring these data using ERTS are described. Author

N74-30815* Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
TECHNIQUES FOR COMPUTER-AIDED ANALYSIS OF ERTS-1 DATA, USEFUL IN GEOLOGIC, FOREST AND WATER RESOURCE SURVEYS
Roger M. Hoffer *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1687-1708 refs (For availability see N74-30774 20-13)
(Contract NAS5-21880; Grant NGL-15-005-112)
(Paper-I1) CSCL 08F

Forestry, geology, and water resource applications were the focus of this study, which involved the use of computer-implemented pattern-recognition techniques to analyze ERTS-1 data. The results have proven the value of computer-aided analysis techniques, even in areas of mountainous terrain. Several analysis capabilities have been developed during these ERTS-1 investigations. A procedure to rotate, deskew, and geometrically scale the MSS data results in 1:24,000 scale printouts that can be directly overlayed on 7 1/2 minutes U.S.G.S. topographic maps. Several scales of computer-enhanced 'false color-infrared' composites of MSS data can be obtained from a digital display unit, and emphasize the tremendous detail present in the ERTS-1 data. A grid can also be superimposed on the displayed data to aid in specifying areas of interest. Author

N74-30816* California Univ., Davis. Dept. of Electrical Engineering.
MULTISPECTRAL COMBINATION AND DISPLAY OF ERTS-1 DATA
Vidal Raphael Algazi *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1709-1717 refs (For availability see N74-30774 20-13)
(Paper-I2) CSCL 05B

Standard NASA color composites combine the most relevant 3 bands from the 4 MSS bands available. An alternate approach is to extract the principal components of the data by a linear transformation of the 4 bands. This approach leads to a low dimensionality representation of ERTS-1 data with the least degradation, in the mean square sense, of the radiometric accuracy. The technique has been applied with success to ERTS-1 MSS data for several geographic areas in California. For all examples considered the mean square representation error is less than one percent. By combining this dimensionality reduction which our previous results on image enhancement for visual display,

color composites are obtained which contain and display most of the information provided by the ERTS-1 sensors. Author

N74-30817* Canadian Center for Remote Sensing, Ottawa (Ontario).
AFFINE TRANSFORMATIONS FROM AERIAL PHOTOS TO COMPUTER COMPATIBLE TAPES c08
F. G. Peet, A. R. Mack (Dept. of Agr., Ottawa), and L. S. Crosson (Dept. of Agr., Saskatoon) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1719-1724 (For availability see N74-30774 20-13)
(Paper-I3) CSCL 02C

During the development of a project to estimate wheat production, it became necessary to pull data, corresponding to particular fields in a test site, off an ERTS computer compatible tape. Aerial photographs and topographic maps were on hand for the test site. A method was devised, using an affine transformation, to relate the aerial photographs or topographic maps to the tapes. One can thereby access data on the tape corresponding to regions covered by only a few pixels. The theory can be used for the registration of two tapes for the same area and for the geometric correction of images. Author

N74-30818* Stanford Research Inst., Menlo Park, Calif.
ESIAC: A DATA PRODUCTS SYSTEM FOR ERTS IMAGERY (TIME-LAPSE VIEWING AND MEASURING) c08
William E. Evans and Sidney M. Serebreny *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1725-1741 (For availability see N74-30774 20-13)
(PAPER-I4) CSCL 05B

An Electronic Satellite Image Analysis Console (ESIAC) has been developed for visual analysis and objective measurement of earth resources imagery. The system is being employed to process imagery for use by USGS investigators in several different disciplines studying dynamic hydrologic conditions. The ESIAC provides facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. The unique feature of the system is the capability to time-lapse the ERTS imagery and/or analytic displays of the imagery. Data products have included quantitative measurements of distances and areas, brightness profiles, and movie loops of selected themes. The applications of these data products are identified and include such diverse problem areas as measurement of snowfield extent, sediment plumes from estuary dicharge, playa inventory, phreatophyte and other vegetation changes. A comparative ranking of the electronic system in terms of accuracy, cost effectiveness and data output shows it to be a viable means of data analysis. Author

N74-30819* Environmental Research Inst. of Michigan, Ann Arbor.
ADVANCED PROCESSING AND INFORMATION EXTRACTION TECHNIQUES APPLIED TO ERTS-1 MSS DATA c08
William A. Malila and Richard F. Nalepka *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1743-1772 refs (For availability see N74-30774 20-13)
(Paper-I5) CSCL 05B

Conventional automatic data processing and information extraction techniques fall short of providing the information required by the user in some applications. For those cases, advanced techniques are needed to permit the extraction of the necessary information. Advanced techniques are described and examples of their application to ERTS-1 MSS data are provided. The techniques are designed to help overcome problems in location, mensuration, and classification accuracies which result from geometric distortions of the ERTS MSS data, the relatively coarse resolution of the sensor, and variations in atmospheric state over the region to be surveyed. It is shown that each of these factors can seriously degrade one's ability to extract necessary information. Further, it is shown that advanced techniques can alleviate the effects of these factors. Author

N74-30820* Forest Management Inst., Ottawa (Ontario).
INTERPRETATION OF ERTS-1 IMAGERY AIDED BY PHOTOGRAPHIC ENHANCEMENT c14
U. Nielsen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1773-1786 (For availability see N74-30774 20-13)
(Paper-I6) CSCL 14E

Agfacontour film can be used to produce relatively economical enhancements of density differences recorded on film. Image interpreters often ask whether enhancement really increases the information content of the original images. Examples of ERTS-1 imagery enhancements show that it is possible to separate density levels which are not discernible by the human eye. It is stressed that these techniques do not replace the photo interpreter, but rather they aid him in the interpretation process. Subtle density variations are made to stand out and on objective classification of the densities forming the image is produced. Author

N74-30821* Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS c08
Robert H. Rogers, Keith Peacock, and Navinchandra J. Shah *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1787-1804 refs (For availability see N74-30774 20-13)
(Paper-I7) CSCL 05B

A technique is described by which ERTS investigators can obtain and utilize solar and atmospheric parameters to transform spacecraft radiance measurements to absolute target reflectance signatures. A radiant power measuring instrument (RPMI) and its use in determining atmospheric paramaters needed for ground truth are discussed. The procedures used and results achieved in processing ERTS CCTs to correct for atmospheric parameters to obtain imagery are reviewed. Examples are given which demonstrate the nature and magnitude of atmospheric effects on computer classification programs. Author

N74-30822* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
THE PENN STATE ORSER SYSTEM FOR PROCESSING AND ANALYZING ERTS DATA c08
G. J. McMurtry, F. Y. Borden, H. A. Weeden, and G. W. Petersen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1805-1822 (For availability see N74-30774 20-13)
(Paper-I8) CSCL 05B

The Office for Remote Sensing of Earth Resources (ORSER) of the Space Science and Engineering Laboratory (SSEL) at The Pennsylvania State University has developed an extensive operational system for processing and analyzing ERTS-1 and similar multispectral data. Specific results obtained by using this system include a study of land use, discrimination between types of forest resources and vegetation, detection of previously unknown geologic faults and correlation of these with known mineral deposits and ground water, mapping of mine spoils in the anthracite region of eastern Pennsylvania, mapping of strip mines and acid mine drainage in Central Pennsylvania, agricultural land use mapping, and detection of gypsy moth infestation. Author

N74-30823* TRW Systems, Redondo Beach, Calif.
ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION c08
Curtis L. May *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1823-1835 refs (For availability see N74-30774 20-13)
(Paper-I9) CSCL 05B

The background and results of an investigation concerning the use of multispectral data compression in the ERTS program are presented. An average compression of greater than 2:1 has been achieved under the constraint of zero distortion in the reconstructed image, and four MSS tapes can be compressed to fill less than one reel of magnetic tape. A preliminary study of the hardware implementation of this processor proves the feasability of compression at input bit rates of over 100Mbs. Author

N74-30824* TRW Systems, Redondo Beach, Calif.
EVALUATION OF DIGITALLY CORRECTED ERTS IMAGES c08

John E. Taber *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1837-1843 (For availability see N74-30774 20-13)
(Paper-I10) CSCL 09B

The discussion is limited to processes by which a set of data samples collected on a geometrically distorted grid can be converted to samples on a different precisely specified grid. It is assumed that a mathematical expression for the desired transformation already exists. Concern will be the effects on image quality (specifically loss of resolution, photometric accuracy, and miscellaneous aberations) that result from various techniques used in accomplishing the resampling. The resampling techniques evaluated have included nearest neighbor, bilinear, cubic convolution, and various truncated versions of sinc (x). The conclusion is that cubic convolution yields substantially higher quality output data for scenes typically encountered and can, in some instances, substantially enhance one's ability to abstract information.
Author

N74-30825* Itek Corp., Lexington, Mass.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-1 IMAGES
Nicholas Gramenopoulos *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1845-1875 refs (For availability see N74-30774 20-13)
(Paper-I11) CSCL 08B

Results of an automated thematic mapping investigation using ERTS-1 MSS images are presented. A diffraction pattern analysis of MSS images led to the development of spatial signatures for farm land, urban areas, and mountains. Four spatial features are employed to describe the spatial characteristics of image cells in the digital data. Three spectral features are combined with the spatial features to form a seven dimensional vector describing each cell. Then, the classification of the feature vectors is accomplished by using the maximum likelihood criterion. Three ERTS-1 images from the Phoenix, Arizona area were processed, and recognition rates between 85% and 100% were obtained for the terrain classes of desert, farms, mountains and urban areas. To eliminate the need for training data, a new clustering algorithm has also been developed.
Author

N74-30826* Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
PRINCIPAL COMPONENTS COLOUR DISPLAY OF ERTS IMAGERY **c14**
M. M. Taylor *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1877-1897 refs (For availability see N74-30774 20-13)
(Paper-I12) CSCL 14E

In the technique presented, colours are not derived from single bands, but rather from independent linear combinations of the bands. Using a simple model of the processing done by the visual system, three informationally independent linear combinations of the four ERTS bands are mapped onto the three visual colour dimensions of brightness, redness-greenness and blueness-yellowness. The technique permits user-specific transformations which enhance particular features, but this is not usually needed, since a single transformation provides a picture which conveys much of the information implicit in the ERTS data. Examples of experimental vector images with matched individual band images are shown.
Author

N74-30827* Alaska Univ., Fairbanks.
APPLICATIONS OF ERTS DATA TO RESOURCE SURVEYS OF ALASKA
Albert E. Belon and John M. Miller *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1899-1907 (For availability see N74-30774 20-13)
(Paper-I13) CSCL 08F

ERTS data affords a unique opportunity to perform urgently needed resource surveys and land use planning at a critical juncture in the history of Alaska's social and economic development. The available facilities for photographic, optical and digital processing of ERTS data are described, along with the interpretive techniques which have been developed. Examples of the applications of these facilities and techniques are given for three environmental disciplines: vegetation mapping for potential archeological sites; marine and sea ice surveys on the Alaskan continental shelf for the determination of surface circulation and sedimentation patterns and their effects on navigation, pollution assessment, fisheries, location of habors and construction of off-shore structures; snow surveys for inventories of water resources and flood potential in Alaska watersheds.
Author

N74-30828* International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
SCENE CORRECTION (PRECISION TECHNIQUES) OF ERTS SENSOR DATA USING DIGITAL IMAGE PROCESSING TECHNIQUES **c08**
Ralph Bernstein *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1909-1928 refs (For availability see N74-30774 20-13)
(Paper-I14) CSCL 09B

Techniques have been developed, implemented, and evaluated to process ERTS Return Beam Vidicon (RBV) and Multispectral Scanner (MSS) sensor data using digital image processing techniques. The RBV radiometry has been corrected to remove shading effects, and the MSS geometry and radiometry have been corrected to remove internal and external radiometric and geometric errors. The results achieved show that geometric mapping accuracy of about one picture element RMS and two picture elements (maximum) can be achieved by the use of nine ground control points. Radiometric correction of MSS and RBV sensor data has been performed to eliminate striping and shading effects to about one count accuracy. Image processing times on general purpose computers of the IBM 370/145 to 168 class are in the range of 29 to 3.2 minutes per MSS scene (4 bands). Photographic images of the fully corrected and annotated scenes have been generated from the processed data and have demonstrated excellent quality and information extraction potential.
Author

N74-30829* Kansas Univ. Center for Research, Inc., Lawrence.
SPECTRAL AND TEXTURAL PROCESSING OF ERTS IMAGERY **c14**
R. M. Haralick and R. Bosley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1929-1969 refs (For availability see N74-30774 20-13)
(Paper-I15) CSCL 14E

A procedure is developed to simultaneously extract textural features from all bands of ERTS multispectral scanner imagery for automatic analysis. Multi-images lead to excessively large grey tone N-tuple co-occurrence matrices; therefore, neighboring grey N-tuple differences are measured and an ellipsoidally symmetric functional form is assumed for the co-occurrence distribution of multiimage greytone N-tuple differences. On the basis of past data the ellipsoidally symmetric approximation is shown to be reasonable. Initial evaluation of the procedure is encouraging.
Author

N74-30830* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DIGITAL IMAGE ENHANCEMENT TECHNIQUES USED IN SOME ERTS APPLICATION PROBLEMS **c14**
Alexander F. H. Goetz and Fred C. Billingsley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1971-1992 refs (For availability see N74-30774 20-13)
(Paper-I16) CSCL 14E

Enhancements discussed include contrast stretching, multiratio color displays, Fourier plane operations to remove striping and boosting MTF response to enhance high spatial frequency content. The use of each technique in a specific application in the fields of geology, geomorphology and oceanography is demonstrated.
Author

N74-30831*# Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF GRAVITY CONSTANTS AND MEASUREMENT OF CERTAIN FINE GRAVITY EFFECTS
Yu. D. Boulanger and M. U. Sagitov Washington NASA Jul. 1974 101 p refs Transl. into ENGLISH of the book "Operedeleniye Postoyannoy Tyagoteniya i Izmereniye Nekotorykh Tonkikh Gravitatsionnykh Effektov" Moscow, Nauka Press, 1973 67 p
(Contract NASw-2481)
(NASA-TT-F-15722) Avail: NTIS HC $8.25 CSCL 08E

Detection of extraterrestrial gravitational radiation by Weber and other types of antennas and possible sources are discussed.

Techniques and results of determination of the Cavendish constant are presented. Effects of swinging and microseisms are discussed, as well as their effects on determination of gravitational potential second derivatives. Tests for a law of vibration attenuation and accompanying theoretical work are presented. A modified test of equivalence of increased sensitivity is discussed. Author

N74-30832*# National Aeronautics and Space Administration, Washington, D.C.
GEOLOGICAL-PHYSIOGRAPHICAL EVALUATION OF ERTS IMAGES FROM AN AREA IN EASTERN BOLIVIA AND PARTS OF BRAZIL
C. V. Flores Aug. 1974 6 p Transl. into ENGLISH from the Spanish
(NASA-TT-F-15857) Avail: NTIS HC $4.00 CSCL 08G

Evaluations were made of ERTS-1 MSS band 7 imagery in order to find the best photointerpreting techniques for obtaining more geological-physiographical data. Conventional photointerpretation methods were used in the evaluation and results showed that these were satisfactory. Author

N74-30833*# International Business Machines Corp., Huntsville, Ala.
A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME 2: SUPPORTING TECHNICAL DETAILS Final Report
28 Jun. 1974 442 p refs
(Contract NAS5-21942)
(NASA-CR-139035; IBM-74W-00176-Vol-2) Avail: NTIS HC $25.25 CSCL 08H

The Stanford Watershed Model, the Kentucky Watershed Model and OPSET program, and the NASA-IBM system for simulation and analysis of watersheds are described in terms of their applications to the study of remote sensing of water resources. Specific calibration processes and input and output parameters that are instrumental in the simulations are explained for the following kinds of data: (1) hourly precipitation data; (2) daily discharge data; (3) flood hydrographs; (4) temperature and evaporation data; and (5) snowmelt data arrays. The Sensitivity Analysis Task, which provides a method for evaluation of any of the separate simulation runs in the form of performance indices, is also reported. The method is defined and a summary of results is given which indicates the values obtained in the simulation runs performed for Town Creek, Alabama; Alamosa Creek, Colorado; and Pearl River, Louisiana. The results are shown in tabular and plot graph form. For Vol. 1, see N74-27813. A.A.D.

N74-30834*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.
THE USE OF REMOTE SENSING IN MOSQUITO CONTROL
Feb. 1973 17 p refs Original contains color illustrations
(NASA-TM-X-70293; MSC-07644) Avail: NTIS MF $1.45; SOD HC $0.55 CSCL 06C

The technology of remote sensing, developed by the space program for identification of surface features from the vantage point of an aircraft or satellite, has substantial application in precisely locating mosquito breeding grounds. Preliminary results of the NASA technology working cooperatively with a city government agency in solving this problem are discussed. Author

N74-30835*# Long Island Univ., Greenvale, N.Y. Science Engineering Res. Group.
PHOTOGRAPHIC TECHNIQUES FOR ENHANCING ERTS MSS DATA FOR GEOLOGIC INFORMATION Final Report, Jan. 1973 - Mar. 1974
Edward Yost, William Geluso, and Robert Anderson 1 Apr. 1974 37 p refs Original contains color illustrations
(Grant NGR-33-151-006)
(NASA-CR-139389; TR-23) Avail: NTIS HC $5.00 CSCL 14E

Satellite multispectral black-and-white photographic negatives of Luna County, New Mexico, obtained by ERTS on 15 August and 2 September 1973, were precisely reprocessed into positive images and analyzed in an additive color viewer. In addition, an isoluminous (uniform brightness) color rendition of the image was constructed. The isoluminous technique emphasizes subtle differences between multispectral bands by greatly enhancing the color of the superimposed composite of all bands and eliminating the effects of brightness caused by sloping terrain. Basaltic lava flows were more accurately displayed in the precision processed multispectral additive color ERTS renditions than on existing state geological maps. Malpais lava flows and small basaltic occurrences not appearing on existing geological maps were identified in ERTS multispectral color images. Author

N74-30836*# Research Triangle Inst., Research Triangle Park, N.C.
ENGINEERING STUDIES RELATED TO GEODETIC AND OCEANOGRAPHIC REMOTE SENSING USING SHORT PULSED TECHNIQUES Final Engineering Report for Task D
May 1973 44 p refs Prepared by North Carolina State Univ.
(Contract NAS6-2135)
(NASA-CR-137464) Avail: NTIS HC $5.25 CSCL 08C

Theoretical basis is presented for a feasibility study of measuring global ocean surface current pattern from satellites and aircraft. The analysis is supported by some preliminary laboratory experiments. Since the ultimate goal is to establish an operational routine for monitoring the global current pattern, a nondisturbing remote sensing device using a laser probe was developed. Detailed construction of the measuring system and the results of some preliminary observations are also presented. Author

N74-30837# Joint Publications Research Service, Arlington, Va.
SOME FUNDAMENTAL PROBLEMS IN MEASURING AND COMPUTING A SATELLITE GEODETIC VECTOR TRAVERSE ARCTIC-ANTARTICA
F. Khalmosh 10 Jul. 1974 15 p refs Transl. into ENGLISH from Acta Geod., Geophys. Montanistica (Hungary), v. 8, no. 1-2, 1973 p 3-14
(JPRS-62436) Avail: NTIS HC $4.00

A method and instrument for measuring a satellite vector traverse are described. Author

N74-30838*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. 1: PIGMENTS
R. Ikan, Z. Aizenshtat, M. J. Baedecker, and I. R. Kaplan [1974] 28 p refs
(Grant NGR-05-007-221)
(NASA-CR-139394; Publ-1243) Avail: NTIS HC $4.50 CSCL 08J

Sediment from Tanner Basin, the outer continental shelf off Southern California, was analyzed for photosynthetic pigments and their derivatives, namely carotenes and chlorins. Samples of the sediment were also exposed to raised temperatures (65, 100, 150 C) for various periods of time (1 week, 1 month, 2 months). Analysis of the heat-treated sediment revealed the presence of alpha-ionene and 2,6-dimethylnapthalene, thermal degradation products of Betacarotente. Chlorins were converted to nickel porphyrins of both DPEP and etio series. Possible mechanisms of these transformations are presented. Author

N74-30839*# California Univ., Los Angeles. Dept. of Geophysics and Planetary Physics.
THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. 2: ISOPRENOIDS
R. Ikan, M. J. Baedecker, and I. R. Kaplan [1974] 45 p refs
(Grant NGR-05-007-221)
(NASA-CR-139195; Publ-1244) Avail: NTIS HC $5.25 CSCL 08J

A series of isoprenoid compounds were isolated from a heat treated marine sediment (from Tanner Basin) which were not present in the original sediment. Among the compounds identified were: phytol, dihydrophytol, c-18-isoprenoid ketone, phytanic and pristanic acids, c-19 and c-20-monoolefines, and the alkanes pristane and phytane. The significance and possible routes leading to these compounds is discussed. Author

N74-30840*# Old Dominion Univ. Research Foundation, Norfolk, Va.

A STUDY OF STRATOSPHERIC GASES CATALYTICALLY REACTING ON ALUMINA Final Report
James L. Cox, Jr. Aug. 1974 7 p refs
(Grant NGR-47-003-077)
(NASA-CR-139563) Avail: NTIS HC $4.00 CSCL 04A

A vacuum system developed to study stratospheric gases reacting on Al2O3. Special attention was given to the reactions of HCl, SO2, and O3. Efforts were made to detect atoms and/or molecules produced by catalytic action of Al2O3 with mass spectrometer. Author

N74-30841*# Linguistic Systems, Inc., Cambridge, Mass.
HEAT TRANSFER IN THE ATMOSPHERE
Ye. M. Feygelson and L. R. Tsvang Washington NASA Jul. 1974 210 p refs Transl. into ENGLISH of the book "Teploobmen v Atmosfere" Moscow, Nauka Press, 1972 p 1-147
(Contract NASw-2482)
(NASA-TT-F-790) Avail: NTIS HC $5.75 CSCL 04A

Data concerning radiant heat transfer in the troposphere in a cloudless sky, in stratiform and broken cloud cover, were obtained by means of aircraft and ground measurements, numerical experiments, and theoretical analysis. Turbulent heat fluxes were measured from aircraft in the boundary layer of the atmosphere in conditions of a clear sky and in convective cloud cover. The basic quantitative relationships of radiant heat transfer were considered depending upon cloud cover-the principal regulator of the transfer of radiation, and also as a function of other factors. Various methods of calculating the radiant influx of heat are compared. Methods of considering radiant heat transfer in problems of the general circulation of the atmosphere and weather forecasting are presented. Author

N74-30842*# Applied Science Associates, Inc., Apex, N.C.
OCEAN DYNAMICS STUDIES Final Report
May 1974 185 p refs
(Contract NAS6-2307)
(NASA-CR-137467) Avail: NTIS HC $12.25 CSCL 08C

Both the theoretical and experimental investigations into current-wave interactions are discussed. The following three problems were studied: (1) the dispersive relation of a random gravity-capillary wave field; (2) the changes of the statistical properties of surface waves under the influence of currents; and (3) the interaction of capillary-gravity with the nonuniform currents. Wave current interaction was measured and the feasibility of using such measurements for remote sensing of surface currents was considered. A laser probe was developed to measure the surface statistics, and the possibility of using current-wave interaction as a means of current measurement was demonstrated. Author

N74-30843*# Research Triangle Inst., Research Triangle Park, N.C.
ENGINEERING STUDIES RELATED TO GEODETIC AND OCEANOGRAPHIC REMOTE SENSING USING SHORT PULSE TECHNIQUES Final Engineering Report for Tasks B and E
L. S. Miller, G. S. Brown, and G. S. Hayne Feb. 1973 120 p refs
(Contract NAS6-2135)
(NASA-CR-137466) Avail: NTIS HC $9.00 CSCL 14B

For the Skylab S-193 radar altimeter, data processing flow charts and identification of calibration requirements and problem areas for defined S-193 altimeter experiments are presented. An analysis and simulation of the relationship between one particular S-193 measurement and the parameter of interest for determining the sea surface scattering cross-section are considered. For the GEOS-C radar altimeter, results are presented for system analyses pertaining to signal-to-noise ratio, pulse compression threshold behavior, altimeter measurement variance characteristics, desirability of onboard averaging, tracker bandwidth considerations, and statistical character of the altimeter data in relation to harmonic analysis properties of the geodetic signal. Author

N74-30844# Joint Publications Research Service, Arlington, Va.
THE EARTH'S FUTURE AND RESEARCH AT PUSHCHINO CITY
N. Moiseyev and L. Repetskiy 1 Jul. 1974 22 p refs Transl. into ENGLISH from Nauka Zhizn (USSR), no. 4, 1974 p 98-111
(JPRS-62356) Avail: NTIS HC $4.25

The future of the planet earth, systems analysis, and scientific projects at the Pushchino Biological Study Center are discussed. For individual titles, see N74-30845 through N74-30846.

N74-30845 Joint Publications Research Service, Arlington, Va.
FUTURE OF THE PLANET AND SYSTEMS ANALYSIS
N. Moiseyev *In its* The Earth's Future and Res. at Pushchino City (JPRS-62356) 1 Jul. 1974 p 1-12 refs Transl. into ENGLISH from Nauka Zhizn (USSR), no. 4, 1974 p 98-104 (For availability see N74-30844 20-13)

The environmental evolution of the earth is discussed. Research and procedures are described which are essential to solving the problem of using national resources rationally and protecting the environment. Models are proposed for biogeocenoses, energy balance, human productive capacity, and world economy. E.J.O.

N74-30846 Joint Publications Research Service, Arlington, Va.
SCIENTIFIC PROJECTS AT PUSHCHINO BIOLOGICAL STUDY CENTER **c04**
L. Repetskiy *In its* The Earth's Future and Res. at Pushchino City (JPRS-62356) 1 Jul. 1974 p 13-21 Transl. into ENGLISH from Nauka Zhizn (USSR), no. 4, 1974 p 106-111 (For availability see N74-30844 20-13)

The Pushchino Biological Study Center is described. Research in the areas of microbiology, biophysics, and agrochemistry is reported. E.J.O.

N74-30847# Joint Publications Research Service, Arlington, Va.
SPACE PHOTOGRAPHIC SURVEYS IN GEOLOGICAL STUDIES
2 Jul. 1974 248 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973
(JPRS-62383) Avail: NTIS HC $15.50

Articles on the utilization of space photographs of the earth are presented. Methods for the remote study of the earth for geological purposes are discussed. Some of the subjects included are: (1) deciphering tectonic lineaments by photographs, (2) scale distortions of a space photograph during its interpretation, (3) deciphering of deep structures and local uplifts, (4) hydrographic interpretations of photographs from space, and (5) the problem of the landscape method of deciphering space photographs. For individual titles, see N74-30848 through N74-30874.

N74-30848 Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF SPACE TECHNIQUES IN GEOLOGICAL STUDIES
V. I. Sevastyanov, V. Ye. Khain, and V. A. Yarmolyuk *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 1-6 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 3-7 (For availability see N74-30847 20-13)

Significant expansion of the mineral-raw material base of the country by increasing the effectiveness of the geological exploration operations in the economically developed regions and also in regions with high prospects are discussed. The development and fastest introduction of new methods of geological research permitting reliable forecasting of the location of deep-lying minerals have the greatest significance in the solution of these problems inasmuch as the surface deposits at the present time are almost exhausted in any case in the economically developed regions. One of the most effective forms of geological evaluation of broad territories is complex regional studies including the geological deciphering of the data provided by aerial and space photographic surveys. Author

N74-30849 Joint Publications Research Service, Arlington, Va.
METHODS OF SPACE GEOLOGY
V. K. Yeremin and Ya. G. Kats *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 7-14 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 8-13 (For availability see N74-30847 20-13)

At the present time space geology has been equipped with remote methods of studying the structure of the earth's crust, as a rule, inherited from the practice of aerogeological research. These methods are based on using electromagnetic waves of different regions of the spectrum emitted, absorbed or reflected by natural objects. The multifrequency sounding of the earth's surface is the basis for remote space forms of research. Depending on the range of the applied electromagnetic oscillations, the following basic methods of space research are distinguished: (1) visual observations (0.4-0.7 microns); (2) photographic and television surveys (0.3-1.1 microns); (3) spectrometric surveying (0.3-3.0 microns); (4) infrared surveying (1.8-5.3 and 7-14 microns); (5) radar surveying (1 mm to 100 cm) and also magnetic, radiation, X-ray and other studies. Author

N74-30850 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF A METHOD OF GEOLOGICAL DECIPHERING OF SPACE IMAGES OF THE EARTH
V. G. Trifonov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 15-21 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 3, 1973 p 14-18 (For availability see N74-30847 20-13)

For the modern stage of the development of geology, finding the most general, planetary laws of geological processes is characteristic. In the development of this scientific area an important role must be played by the geological study of the earth using deciphering and interpretation of space images of the earth's surface. The space photographs permit us to discover the spatial relations between the geological phenomena, large structures and elements of the structures over a large area. The information contained on the photographs does not depend on the accessibility and degree to which the regions have been studied. This is highly significant for the comparison and discovery of the relative role of certain formations. The photographs obtained from the Soviet spacecraft are of special interest inasmuch as they encompass latitudes to 50 degrees. For purposes of geological deciphering, the images of the Caucasus, the mountainous regions of Central Asia and Kazakhstan, the Turan depression, the Kazakhstan hummocky area, Altay and the southern framework of the eastern Siberian highland. Author

N74-30851 Joint Publications Research Service, Arlington, Va.
STUDY OF TELEVISION PHOTOGRAPHS FROM SPACE: MEANS OF TECTONIC DISTRICTING c14
I. I. Bashilova, G. V. Makhin, and V. K. Yeremin *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 22-40 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 19-33 (For availability see N74-30847 20-13)

The deciphering of space television images of the earth and subsequent geological interpretation of the results are discussed. The problems involved in defining specific geological areas from television images are discussed. A study was made of the basic results of using television photographs of the earth over two regions: (1) part of Southern Asia and (2) Western Siberia. When deciphering television space photographs, the tectonic map becomes the primary map and not a derivative document. The specific methods required to establish tectonic mapping as an independent form of study are analyzed with emphasis on the aerospace photographic method. Author

N74-30852 Joint Publications Research Service, Arlington, Va.
STUDY OF THE DISCONTINUOUS TECTONICS BY A SET OF PHOTOGRAPHS OF THE EARTH OF DIFFERENT SCALE TAKEN FROM SPACE (THE MULTISTEP GENERALIZATION METHOD)
V. D. Skaryatin *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 41-61 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 34-50 (For availability see N74-30847 20-13)

The requirement for studying the fractures of the earth's surface is discussed. The method of multistep generalization for application to the study of discontinuous tectonics is described. The method is based on the fact that each scale of the survey has a specific volume of geological information. This implies the necessity of complex application of photographs of different scale to obtain the most complete representation of the geological subjects. The possibility of using space photographs of the earth for different types of geological studies is considered. Author

N74-30853 Joint Publications Research Service, Arlington, Va.
DECIPHERING TECTONIC LINEAMENTS BY PHOTOGRAPHS OF THE CAUCASUS FROM SPACE
S. L. Vyzova, M. L. Kopp, N. N. Kurdin, L. M. Rastsvetayev, and V. G. Trifonov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 62-75 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 51-61 (For availability see N74-30847 20-13)

The space photographs obtained on the Soyuz-9 spacecraft (the scale of the original negatives was 1:6,000,000 to 1 8,000,000) are discussed. These images encompass two belts of northeasterly strike, one of which extends from Batumi to Derbent, and the other runs along the western shore of the southern Caspian. When studying the black and white space photographs of the Caucasus, it is possible to detect linear formations, many of which are not reflected on the geological and tectonic maps compiled earlier. These structures are distinguished on the space photographs by color from the adjacent sections or they are sharp boundaries of fields with different intensity of photographic background. Frequently they correspond to the specific forms of relief: the straight valleys or sections of different valleys located one as a continuation of the other, the scarps in the relief and the boundaries of the zones with different style of relief and nature of erosion dismemberment. Author

N74-30854 Joint Publications Research Service, Arlington, Va.
ROLE OF SPACE PHOTOGRAPHS IN SOLVING THE PROBLEMS OF THE REGIONAL TECTONICS OF THE SOUTHEASTERN PART OF THE CAUCASUS
V. Z. Sakhatov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 76-82 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 62-66 (For availability see N74-30847 20-13)

Photographs of the earth's surface taken in different bands of the visible part of the spectrum are discussed. The problems which are to be solved by space photographs of the earth include the following: (1) the discovery of new and the more precise definition of the known regional structures, (2) the discovery of the possibility of tracing the hidden structures, and (3) analysis of the deep structure of the territories by interpreting the images from space photographs. On this level, the southeastern caucasus is of special interest in proving the use of space photographs as one of the best studied regions of the Soviet Union. Author

N74-30855 Joint Publications Research Service, Arlington, Va.
INTERPRETABILITY OF TECTONIC STRUCTURES OF REGIONS OF YOUNG EPIPLATFORM MOUNTAIN FORMATION ON SPACE PHOTOGRAPHS OF THE EARTH (IN THE EXAMPLE OF THE SOUTHWESTERN TIEN SHAN)
V. I. Makarov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 83-91 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 67-74 (For availability see N74-30847 20-13)

The Tien Shan is one of the key regions for studying the feasibility of using images of the earth obtained from space for studying the tectonics of young epiplatform mountain structures. It has been relatively well investigated in geological respects and is registered on space photographs of different scales. The latter circumstance, in addition to making it possible to evaluate the resolution of photographs at different scales, makes it possible to carry out their comparative analysis and thereby ascertain the difference in scale of tectonic formations and to determine objectively their subordination or rank. The Tien Shan is among the regions where the most recent tectonic movements (Pg-Q) are manifested particularly clearly and have attained great amplitudes and contrast. They occupied an area whose geosynclinal development was already completed by the end of the Paleozoic and which then over a long period (Mz-Kz1) developed in a regime close to a platform regime. Accordingly, three structural stages and their corresponding formations participate in the complex geological structure of the Tien Shan. Author

N74-30856 Joint Publications Research Service, Arlington, Va.
USE OF SPACE PHOTOGRAPHS TO STUDY THE TECTONICS OF THE SAHARA PLATFORM

D. M. Trofimov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 92-99 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 75-84 (For availability see N74-30847 20-13)

The interpretation of photographic and television imagery of the Sahara Platform is discussed. The studies are based on imagery received from unmanned satellites and Gemini flights. Additional photography from the Zond-5 automated station was included in the study. The geological materials produced geological and tectonic maps of Africa on a scale of 1:5,000,000. An analysis of the geographical and geological features of various African regions is developed. Author

N74-30857 Joint Publications Research Service, Arlington, Va.
CONSIDERATION OF THE SCALE DISTORTIONS OF A SPACE PHOTOGRAPH DURING ITS INTERPRETATION
c14

G. B. Gonin and L. I. Pogodina *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 100-104 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 81-84 (For availability see N74-30847 20-13)

The effects of scale distortions on the accuracy of photointerpretation of space photography are discussed. The information about the scale of the image in various parts of the space photograph can be useful when determining the dimensions of the deciphered objects. The numerical basis for solving scale problems of space photography is analyzed. Mathematical models are developed to show the relationships of the parameters. Systems of coordinates for determining the scale of the space photograph are reported. Author

N74-30858 Joint Publications Research Service, Arlington, Va.
MEAN CHEMICAL COMPOSITION AND ORIGIN OF THE GRANITE AND BASALT SHELLS OF THE LITHOSPHERE

A. A. Beus *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 105-113 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 85-91 (For availability see N74-30847 20-13)

The mean chemical composition of the granite shell of the lithosphere was calculated as the mean for 65 regions of the earth on the basis of the statistically calculated mean compositions of all the principal types of magmatic and metamorphic rock. The estimates of the mean propagation of various types of rock were obtained by measuring the areas on 12 small-scale geological maps which are the typical regions of Europe, Asia, Africa, North and South America. In estimating the chemical composition of the basalt shell, the available experimental data on the density of a number of rocks were used, the presence of which can be assumed under the conditions of the granulitic and eclogitic zones of metamorphism, along with the seeds of transmission in them of longitidunal seismic waves at high pressures characteristic of these zones of metamophism. Author

N74-30859 Joint Publications Research Service, Arlington, Va.
BASIC TRENDS IN THE DEVELOPMENT OF COLLECTIVE RECRYSTALLIZATION IN VEINED GRANITES

Yu. B. Marin *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 114-120 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 92-96 (For availability see N74-30847 20-13)

The role of recrystallization in the formation of pegmatites is discussed. The application of crystallization theory to the formation of granite structures is developed. The effects of temperature variation and variation in the chemistry of the solutions causing a different course of the recrystallization process are analyzed. The classification of intragranite pegmatites in shallow depth formations is explained. Author

N74-30860 Joint Publications Research Service, Arlington, Va.
STRUCTURE OF THE TURAN PLATFORM BY THE DATA FROM COMPLEX INTERPRETATION OF THE GEOLOGICAL-GEOPHYSICAL AND COSMOGEOLOGICAL STUDIES (IN CONNECTION WITH THE PROSPECTS OF OIL AND GAS BEARING)

S. M. Bogorodskiy, V. P. Gabrilov, L. G. Kiryukhin, and M. T. Kozitskaya *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 121-139 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 97-111 (For availability see N74-30847 20-13)

The practical use of the information obtained during space surveys combined with the materials of geological-geophysical studies to decode the structure of the Turan platform is discussed. The study of the structure of the Turan platform which is a tectonic type of young platform is not only of theoretical interest but also practical interest inasmuch as numerous deposits of different types of mineral composition are connected with it, and oil and gas primarily. The distribution of the latter in many cases, as is known, is controlled by structural-tectonic factors. Therefore, in decoding the deep geological structure of the platform regions, the geophysical methods occupy the leading place: magnetic and gravimetric, electric and seismic prospecting. However, the effectiveness of these methods can be appreciably improved by combining them with cosmogeological observations. Author

N74-30861 Joint Publications Research Service, Arlington, Va.
DECIPHERING THE DEEP STRUCTURE AND LOCAL UPLIFTS BY SPACE PHOTOGRAPHS OF THE TURAN PLATFORM

P. V. Florenskiy *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 140-147 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 112-117 (For availability see N74-30847 20-13)

The interpretation of spaceborne photography to decipher the deep structure and local uplifts of the Turan Platform in Russia is discussed. The geological aspects of the Turan Platform are described. The conclusions which have been reached as a result of analyzing the space photography are reported. An important part of the survey is the determination that local uplifts which contain gas and oil deposits are reflected on the photographs. Author

N74-30862 Joint Publications Research Service, Arlington, Va.
PROSPECTS OF THE APPLICATION OF MATERIALS FROM SPACE SURVEYS FOR HYDROGEOLOGICAL RESEARCH

I. K. Abrosimov and Ye. A. Vostokova *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 148-161 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 118-128 (For availability see N74-30847 20-13)

The application of spaceborne photography and aerial surveys for hydrogeological purposes is discussed. The factors and components of the topography which assist in identifying hydrogeologic resources are identified. The application of the photographs for hydrogeological research includes two interrelated processes: (1) the establishment of the relation of the ground water to the physionomic components of the landscape and the morphostructural conditions, and (2) the determination of the deciphering attributes of these groundwater indicators. Specific examples of hydrogeological research are reported based on various types of photographic recordings. Author

N74-30863 Joint Publications Research Service, Arlington, Va.
HYDROGRAPHIC INTERPRETATION OF PHOTOGRAPHS FROM SPACE

T. G. Svatkova *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 162-167 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 129-132 (For availability see N74-30847 20-13)

The information capacity of space photographs and the possibility of obtaining a number of morphometric characteristics of the lakes and rivers was investigated. The interpretation of the photography showed that the following possibilities existed: (1) determination of the completeness of the representation of the hydrographic network, (2) discovery of the possibility of drawing the watershed dividing lines, and (3) discovery of the individual attributes of the rivers and lakes which are reflected on the photograph and which can serve as the index of their regime. Author

N74-30864 Joint Publications Research Service, Arlington, Va.
INTERPRETING THE SOIL COVER BY SPACE PHOTOGRAPHS

V. I. Kravtsova *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 168-176 refs Transl. into

ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 133-139 (For availability see N74-30847 20-13)

An analysis of the photographs from space, especially color photographs taken from the Soyuz, Gemini and Apollo spacecraft and also from the first orbital station, the Salyut, indicates that it is entirely possible to use them to study the soil cover although the differences in soil types are not reflected so well as, for example, the differences in lithologically nonuniform rock. However, in a number of cases the decipherable peculiarities of the structure of the soil cover can help to study the geological structure of the territory. The examples of deciphering the soil cover on the space photographs, in contrast to their geological deciphering, are quite rare. One of the causes is the strong dependence of the image of the soil cover on the moisture conditions at the time of the survey or during the period directly preceding it. Thus, the effort to study the spotty picture of the soil exchange in the lacustrine depressions of northwestern Nevada turned out to be unsuccessful as a result of the fact that the photographs received with an interval of three months from the Gemini-4 and Gemini-5 spacecraft turned out to be incomparable since they were taken under different moisture conditions.

Author

N74-30865 Joint Publications Research Service, Arlington, Va.
SPECIAL METHODS FOR THE REMOTE STUDY OF THE EARTH FOR GEOLOGICAL PURPOSES

A. G. Ryabukhin *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 177-190 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 140-149 (For availability see N74-30847 20-13)

The various methods for conducting remote investigations of geological formations are described. The methods considered are: (1) spectrometric survey of electromagnetic radiation of natural features, (2) infrared spectrometry to determine temperature inhomogenieties of the radiation surface, and (3) microwave spectrometric sensing based on radiobrightness temperature caused by nonuniformity of the radiation coefficient of natural formations. Specific examples of the application of the types of sensors are included. Author

N74-30866 Joint Publications Research Service, Arlington, Va.
POSSIBILITIES OF USING SPACE INFRARED PHOTOGRAPHS OBTAINED FROM THE METEOR SATELLITE SYSTEM IN GEOLOGY (IN THE EXAMPLE OF EASTERN KAZAKHSTAN)

V. Z. Sakhatov, N. V. Skublova, and N. A. Yakovlev *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 191-199 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 150-156 (For availability see N74-30847 20-13)

The use of infrared imagery obtained by artificial earth satellites in conducting geological surveys is discussed. The characteristics of the radiometers used for infrared sensing are described. Specific applications of the infrared sensing technique to volcanic activity and geological formations are reported. Spaceborne photographic imagery and infrared imagery are compared to show areas of similarity. The analysis of anomalies as a method of identifying terrestrial objects if explained.

Author

N74-30867 Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR DETERMINING THE COORDINATES OF CAVITIES WITH ICELAND SPAR

V. G. Semenov, N. N. Sokolov, and V. V. Chebykin *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul 1974 p 200-208 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 157-163 (For availability see N74-30847 20-13)

The procedure for determining the coordinates of the cavities of Iceland spar is described. The operating principle of the equipment is based on the reflection of short ultrasonic pulses from the sharply different acoustic boundaries. The depth of the penetration of the pulses is determined by the power of the radiation and the sensitivity of the receiver. A diagram of the ultrasonic generator is provided. Mathematical models are developed to show the relationships of the parameters. Curves are shown which depict the type of data received from surveys conducted with the test equipment. Author

N74-30868 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF DRILLING BOREHOLES WITH INTENSE DISTORTION **c15**

B. F. Golovchenko *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 209-215 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 164-169 (For availability see N74-30847 20-13)

Drilling techniques for geological exploration are discussed. A numerical analysis of drilling displacements is developed. The equipment used for various types of drilling operations is described. A diagram of the distortion of a well by drilling from a scarp is provided. Specific examples of wells that were drilled under various conditions are reported. Author

N74-30869 Joint Publications Research Service, Arlington, Va.
THEORETICAL AND EXPERIMENTAL STUDIES OF THE EXHAUST SYSTEM OF A MOTORIZED DRILL **c15**

N. B. Ostapenko, V. V. Alekseyev, and I. P. Soldatov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 216-225 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 170-177 (For availability see N74-30847 20-13)

In the underground mines it is necessary to deal with the problem of the removal of exhaust gases to the mouth of the adit or shaft, which is realized by means of durite or metal exhaust pipes. Since the exhaust of the gases from the cylinder of an internal combustion engine takes place periodically, the exhaust system of the drill must have fluctuations of the column of gas in the exhaust pipe. These fluctuations can have a strong effect on the basic operating parameters of the engine (power, counterpressure at the exhaust, torque, rpm, and so on). Theoretical studies of the effect of the oscillatory processes in the exhaust system of a motorized drill on the basic engine parameters are presented. Author

N74-30870 Joint Publications Research Service, Arlington, Va.
DEPRECIATION NORMS FOR DRILLING EQUIPMENT AND MEANS OF IMPROVING THEM **c15**

G. Sh. Kiziriva *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 226-229 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 178-181 (For availability see N74-30847 20-13)

A method for determining allowable depreciation of mining equipment is discussed. The method provides the production organization with the possibility of writing off the largest part of the initial cost of the equipment during the first years is presented. Advantages and disadvantages of the system are discussed. The formula for calculating the depreciation allowance is provided.

Author

N74-30871 Joint Publications Research Service, Arlington, Va.
CONCENTRIC ARCH STRUCTURES IN THE EASTERN PART OF THE TURAN PLATFORM ON PHOTOGRAPHS FROM SPACE

S. S. Shults *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 230-233 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 182-184 (For availability see N74-30847 20-13)

Remote studies of the earth from space have to a great extent permitted a new representation of the structure of the continents and detection of previously unknown structures of the continental crust. One of the most interesting and unexpected results of deciphering the space photographs was the detection in various parts of the continents of a large number of concentric structures from several kilometers to hundreds of kilometers in diameter. These structures are especially well traced on the shields of the ancient and young platforms and in the regions of shallow (1-2 km from the surface) occurrence of the basement under the platform mantle. The series of concentric structures frequently imbedded one in the other is clearly deciphered on the photographs of the eastern part of the Turan platform taken from space within the limits of the Kyzylkumy Desert, the Southeastern and Eastern Priaral'ye (Aral region), the lower and middle courses of the Syrdar'ya River. Author

N74-30872 Joint Publications Research Service, Arlington, Va.
ALGAE-LIKE MICROFOSSILS IN THE ARCHEAN ROCK OF SOUTH INDIA

A. S. Lopukhin and V. M. Moralev *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 234-238 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 185-187 (For availability see N74-30847 20-13)

Samples collected in two regions in South India from the series which are the most ancient on the Hindustan shield were subjected to micropaleophytologic investigation. Studies were made of the organic remains from the graphite gneisses entering into the complex of metamorphic rock more ancient pre-Darwar complex has an age of more than 3000 million years. The new definitions of the absolute age of the rock in this complex of primarily hornblende-biotitic and hornblende and also charnockite gneisses, give figures from 2800-2900 to 3130-3205 million years. The graphite gneisses combined with the pre-Darwar complex are encountered rarely, but in places they are made up of sustained beds stretching kilometers with a thickness of 5-10 meters. The investigated sample was taken in the Sivagang deposit located south of Madurai in the southern part of Tamil-Nadu (formerly the state of Madras). Author

N74-30873 Joint Publications Research Service, Arlington, Va.
NEW TEXT ON CRIMEAN GENERAL GEOLOGICAL PRACTICE
L. A. Ragozin and Ya. G. Kats *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 239-242 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 188-189 (For availability see N74-30847 20-13)

The geological characteristics of the Crimea are presented. The subjects discussed are: (1) the geological structure, (2) geological processes of weathering, eolian activity, gravitational, and karstic processes, and (3) an analysis of river erosion, marine abrasion, earthquakes, and oscillatory movements. A guide for geological tours of the Crimea is provided based on actual experiences of the author. Specific examples of geological structure and weathering for selected areas of the crimea are described. Author

N74-30874 Joint Publications Research Service, Arlington, Va.
PROBLEM OF THE LANDSCAPE METHOD OF DECIPHERING SPACE PHOTOGRAPHS (SEMINAR ON THE GEOGRAPHIC DECIPHERING OF SPACE PHOTOGRAPHS AT THE GEOGRAPHY DEPARTMENT OF MOSCOW STATE UNIV.)
T. P. Onufriyuk *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 243-245 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 190-191 (For availability see N74-30847 20-13)

The proceedings of a seminar on the geographic decoding of space photographs are presented. The geographic studies used to determine the deciphering attributes for the space photographs which are of definite interest for geological deciphering are discussed. The experiences of various investigators in deciphering spaceborne photography are reported. Applications of space photography for soil science and vegetation growth are emphasized. Author

N74-30875# Commissariat a l'Energie Atomique, Grenoble (France).
MEASUREMENT OF THE DYNAMIC CHARACTERISTICS OF ATMOSPHERIC DIFFUSION Ph.D. Thesis - Univ. Scientifique et Medicale de Grenoble, France
F. Rigot-Muller Jan. 1974 68 p refs In FRENCH
(CEA-R-4501) Avail: AEC Depository Libraries HC $5.50

A method is proposed for studying the diffusion of atmospheric pollutants above real sites, which considers the actual magnitudes encountered. In view of justifying the method, fundamental theories concerning diffusion are presented together with different models for the atmosphere. The atmosphere is then considered as a linear filter to which the process identification method is applied. The pulse response of the filter is examined in the pollutant-time plane. The limits of the method and its field of application are discussed. The concepts of ergodism and stationaryness are introduced. Various diffusion experiments carried out under different conditions are reviewed. Information on the effect of obstacles and the roughness of the ground is given together with calculations on the longitudinal diffusion and the transport velocity. Author (NSA)

N74-30876# Defence Research Establishment Ottawa (Ontario).
WINTER ICE RECONNAISSANCE IN NARES STRAIT, 1972 - 1973
Moira Dunbar Feb. 1974 28 p refs
(AD-779687; DREO-TN-73-26) Avail: NTIS CSCL 08/12

The report is the third in a series of reports describing winter ice conditions in Nares Strait. Three flights were made in 1972-73, using radar scope photography on the first and Sideways Looking Airborne Radar on the others. The ice consolidated even earlier than in the previous year, in response to another winter of comparatively calm winds. Author (GRA)

N74-30877# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MORPHOLOGY OF IONOSPHERIC SCINTILLATION
Robert K. Crane 21 May 1974 88 p refs
(Contract F19628-73-C-0002; AF Proj. 1508A)
(AD-780522; TN-1974-29; ESD-TR-74-212) Avail: NTIS CSCL 04/1

The report is directed toward providing information to communication systems designers first about scintillation as observed in a single experiment, second about the adequacy of the existing models used to interpret scintillation data, and finally about the variation of scintillation with geophysical parameters. GRA

N74-30878# Naval Research Lab., Washington, D.C.
GEOPHYSICAL ASPECTS OF ATMOSPHERIC REFRACTION Final Report
Charles G. Purves 7 Jun. 1974 45 p refs
(AD-780433; NRL-7725) Avail: NTIS CSCL 04/1

The purpose of this paper is to discuss some of the geophysical aspects of atmospheric refraction and its effect on radars. Of special concern is the cause-and-effect relationships associated with the trapping of electromagnetic energy into atmospheric duct layers that result in anomalous propagation conditions and extend radar ranges far beyond the normal radar horizon. GRA

N74-30879# Army Electronics Command, Fort Monmouth, N.J.
AEROSOL ANGULAR SCATTERING FUNCTIONS FOR MODEL ATMOSPHERES
Israel Cantor May 1974 26 p refs
(DA Proj. 1T1-62111-A-126)
(AD-780063; ECOM-5540) Avail: NTIS CSCL 04/1

A new set of tables is derived (as a function of wavelength, scattering angle, meteorological range, and size parameter), providing values of the aerosol angular scattering functions for the Elterman clear standard and hazy model atmospheres with an effective refractive index of 1.5. The selected wavelengths for each size parameter are 0.40, 0.45, 0.55, 0.65, 0.85, 1.0, and 1.2 micrometers; the scattering angles for each wavelength are 1, 4, 7, 10, 30, 60, 80, 90, 110, 120, 130, 150, and 180 degrees; the meteorological ranges for each wavelength are 23, 13, 10, 8, 6, 5, 4, 3, and 2 km, and the size parameters selected 2.5 and 4.0, represent the lower and upper limits in the Junge power law size distribution. These tables will facilitate angular scattering calculations in the field of optical propagation through the atmosphere. Author (GRA)

N74-30880# Naval Civil Engineering Lab., Port Hueneme, Calif.
SOIL MECHANICS AND THE ADVANCED COMPUTER CODES
J. B. Forrest Apr. 1974 35 p refs
(AD-777051; NCEL-TN-1324) Avail: NTIS CSCL 08/13

The report discusses some of the more complex soil models available for input to advanced computer codes. It provides a brief overview of the impact of recent computer code advances upon development within the field of soil mechanics. Two different types of models are discussed: (1) variable moduli models based upon incremental elasticity, and (2) elastic-plastic models in which plastic yielding conditions are superimposed upon elastic behavior. The difficulties involved in using experimental data to fit a soil model are considered briefly and the major requirements for acceptable soil constitutive models are presented. The report concludes that the most fruitful avenue of pursuit for future

soil-structure interaction studies will involve a versatile form of the variable moduli model. Author (GRA)

N74-30881# Battelle-Northwest, Richland, Wash.
WAVE-PARTICLE INTERACTIONS IN THE MAGNETOSPHERIC PLASMA Final Report
Michael Schulz 15 Apr. 1974 161 p refs Prepared in cooperation with Aerospace Corp., El Segundo, Calif.
(Contract N00014-73-C-0333; ARPA Order 2141)
(AD-780276; ATR-74(7420)-1) Avail: NTIS CSCL 04/1

Contents: Crude approximations to some aspects of three-dimensional magnetospheric dynamics; Effect of instabilities on ring current; Evaluation of limit on stably trapped particle flux; Particle lifetimes in strong diffusion; Particle saturation of the outer zone; Trapping of particles by waves in a non-uniform plasma; Phase-integral approximation of Pc-4 eigenfrequencies; Necessary conditions for bounce-resonant wave amplification; Electromagnetic radiation from a helically phased particle beam; Computer simulation of an ion beam antenna; Radiation from a line source carrying a traveling wave in a magnetoplasma. GRA

N74-30882# Bureau of Mines, Laramie, Wyo.
METHODS FOR REFINING CRUDE SHALE OIL PRODUCED BY IN SITU RETORTING
Clyde M. Frost and Philip L. Cottingham Jan. 1974 27 p refs
(PB-229217/5; BM-RI-7844) Avail: NTIS HC $3.25 CSCL 08I

Crude shale oil produced during in situ combustion retorting experiments by the Bureau of Mines at Rock Spring, Wyoming, was refined by three different processing schemes. The crude oil was fractionated to raw naphtha and 400 F plus residuum in the first experiment. The 400 F plus residuum was hydrogenated over cobalt molybdate catalyst at 815 F and 1,100 psig. An aliquot blend of the raw naphtha and 160 F to 400 F hydrogenated naphtha was hydrogenitrified and then catalytically reformed. The 400 F plus hydrogenated oil was catalytically cracked. The total crude was hydrogenated over nickel-tungsten catalyst at 800 F and 1,500 psig in the second scheme. The third scheme was similar to the second except that prior to the hydrogenation step, the total crude was hydrostabilized over cobalt molybdate at 500 F and 500 psig. (Modified author abstract) GRA

N74-30883# Woods Hole Oceanographic Institution, Mass.
SUSPENDED MATTER OTHER PROPERTIES OF SURFACE WATERS OF THE NORTHEASTERN ATLANTIC OCEAN
K. O. Emery, Fred Lepple (Delaware Univ.), Lois Toner, Elazar Uchupi, R. H. Rioux, Walter Pople (Natal Univ.), and E. M. Hulburt Mar. 1974 61 p refs
(Grant NSF GX-28193)
(PB-229895/8; WHOI-74-17; WHOI-Contrib-3296) Avail: NTIS HC $3.75 CSCL 08J

Samples of suspended matter were collected at 1534 stations off the west coast of Africa during two geophysical cruises of 1972 and 1973. Many correlations exist with respect to auxiliary measurements of winds, temperature, salinity, currents, chlorophyll, phytoplankton, zooplanktonnekton, dustfall, and proximity to major river mouths. Some of the relationships can be expressed in terms of oceanic zones. (Modified author abstract) GRA

N74-30884# Perception Technology Corp., Winchester, Mass.
USE OF SYMBOLIC MANIPULATION TECHNIQUES TO EXAMINE GRAVITATIONAL AND UNIFIED FIELD THEORIES Final Technical Report, 30 Jun. 1973 - 15 Jun. 1974
Huseyin Yilmaz and Richard Pavelle 15 Jun. 1974 89 p refs
(Contract DAHC15-73-C-0369)
(AD-780195) Avail: NTIS CSCL 20/10

Contents: Verification of the field equations; Equations of motion and conservation laws; Skew-symmetric phi sub mu nu and unified field theory; New capabilities of MACSYMA, the tensor package. GRA

N74-30885# Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.
SPECTRAL RADIATION PROPERTIES OF THE ATMOSPHERE AND THE EARTH: PROFILES OF WATER VAPOR AND METHANE MIXING RATIOS FROM MEASUREMENTS WITH BALLOON BORNE INSTRUMENTS Final Report
Peter Burkert, Dieter Rabus, and Hans-Jurgen Bolle Dec. 1973 30 p refs
(Grant AF-AFOSR-2282-72; AF Proj. 7621)
(AD-780526; AFCRL-TR-74-0240) Avail: NTIS CSCL 04/1

In previous reports a two channel filter radiometer has been described to be used for the determination of mixing ratios of minor constituents in the stratosphere from aboard a balloon or a sounding rocket. Two of these instruments were flown in a balloon on April 5, 1971. Besides testing the instruments the intention was to develop and test evaluation techniques for the transmission data from the instruments and get a first value of mixing ratio for water vapor and methane in the lower stratosphere. Evaluation techniques are described and water vapor and methane profiles between 12 and 30 km altitude are shown which were derived from the data of this balloon flight. Author (GRA)

N74-31054 Joint Publications Research Service, Arlington, Va.
STATISTICAL ASPECTS OF THE METEOROLOGICAL ANALYSIS OF INDUCTIVE AERIAL GEOPHYSICAL EXPLORATION SCHEMES
A. F. Kotyuk *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 71-77 ref Transl. into ENGLISH of "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 71-78 (For availability see N74-31043 20-19)

N74-31057 Joint Publications Research Service, Arlington, Va.
LINEAR MAPPING OF A RANDOM PROCESS THAT REPRESENTS RANDOM REFLECTIONS
V. F. Chudesenko *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 87-89 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 89-92 (For availability see N74-31043 20-19)

N74-31105 Joint Publications Research Service, Arlington, Va.
DETERMINING THE INFORMATION RELATION BETWEEN THE PRESSURE FIELDS OF THE ATMOSPHERE AND THE ICE DRIFT IN THE ARCTIC SEAS (IN THE EXAMPLE OF THE LAPTEV SEA)
A. I. Murzin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 106-114 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 74-79 (For availability see N74-31096 20-20)

N74-31106 Joint Publications Research Service, Arlington, Va.
PROBABILITY CALCULATIONS OF THE DEPTH OF THE SNOW COVER CONSIDERING THE TERRITORIAL NONUNIFORMITY OF OCCURRENCE
A. P. Sofiyan and A. I. Mazur *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 115-123 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 80-85 (For availability see N74-31096 20-20)

N74-31107 Joint Publications Research Service, Arlington, Va.
EFFECT OF LIGHT AND TEMPERATURE DURING THE FALL ON THE WINTERING AND HARVEST OF WINTER CROPS
A. I. Korovin and Ye. V. Manayev *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 124-135 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 86-93 (For availability see N74-31096 20-20)

N74-31108 Joint Publications Research Service, Arlington, Va.
OSCILLATIONS WITH VAISAELAE FREQUENCY IN A GEOSTROPHIC CURRENT FIELD
M. T. Savin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 136-141 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 94-97 (For availability see N74-31096 20-20)

N74-31109 Joint Publications Research Service, Arlington, Va.
EFFECT OF AN OIL SLICK ON THE SEA SURFACE ON TURBULENCE AND THE LAYER OF THE ATMOSPHERE NEXT TO THE WATER
O. A. Kuznetsov and G. N. Panin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 142-146 refs

Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 97-99 (For availability see N74-31096 20-20)

N74-31110 Joint Publications Research Service, Arlington, Va.
CONSTRUCTING A MODEL OF THE OPENING UP OF LARGE RIVERS
E. A. Bondarev, A. V. Kolmogorov, and L. I. Fayko *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 147-151 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 99-101 (For availability see N74-31096 20-20)

N74-31111 Joint Publications Research Service, Arlington, Va.
POWER FORMULAS FOR RIVERBEDS WITH A HIGH DEGREE OF ROUGHNESS
A. K. Ryabov *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 152-156 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 102-104 (For availability see N74-31096 20-20)

N74-31112 Joint Publications Research Service, Arlington, Va.
CALCULATING THE VELOCITY PROFILE OF MUDFLOWS
V. I. Yefremov *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 157-164 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 104-107 (For availability see N74-31096 20-20)

N74-31113 Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF AVALANCHE MOVEMENT
A. I. Korolev *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 165-168 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 107-108 (For availability see N74-31096 20-30)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-30886* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STAR SCANNER Patent
Richard L. Gutshall (Ball Bros. Res. Corp.), Randall T. McConaughey (Ball Bros. Res. Corp.), and Frank A. Volpe, inventors (to NASA) Issued 6 Aug. 1974 9 p Filed 29 Sep. 1972 Supersedes N73-11404 (11 - 02, p 0173)
(NASA-Case-GSC-11569-1; US-Patent-3,827,807; US-Patent-Appl-SN-293725; US-Patent-Class-356-141; US-Patent-Class-33-268; US-Patent-Class-250-203R; US-Patent-Class-356-147) Avail: US Patent Office CSCL 20F

A star scanner on a spin stabilized spacecraft is described which includes a reticle with a pair of slits having different separations as a function of the spacecraft vertical plane, to form a V slit. The time between a star image crossing one of the slits relative to a reference telemetry time provides an indication of azimuth angle. The time between the image crossing the two slits provides an indication of elevation angle of the star. If a star cluster is detected such that two stars pass the slits in less time than normally required for a single star to cross the two slits, an indication of the cluster occurrence is derived. Means are provided to prevent effective detection of large celestial bodies, such as the sun or moon.
Official Gazette of the U.S. Patent Office

N74-30887 British Library Lending Div., Boston Spa (England).
CONTACTLESS PYROMETER
A. Nowakowski May 1974 9 p refs Transl. into ENGLISH from Pomiary, Automat., Kontr. (Poland), V. 6, no. 8-9, 1970 p 356-358
(BLL-RTS-8858) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A method of contactless measurement of temperature is discussed on the basis of the total energy of IR radiation. The construction and parameters are presented for an instrument for the point measurement of temperature of objects difficult to rearch, which was applied to the investigation of electric motor rotors.
Author

N74-30888 Syracuse Univ., N.Y.
ANALYSIS AND MEASUREMENT OF THE PERFORMANCE OF A SIGNAL TRACKING LOOP FOR A SATELLITE RADAR ALTIMETER WHEN EXCITED BY A RANDOM PROCESS Ph.D. Thesis
Ernest Lee Hofmeister 1973 276 p
Avail: Univ. Microfilms Order No. 74-17582

The problem treated is the system design, performance analysis, and performance measurement of a signal tracking loop for a satellite radar altimeter operating over the ocean areas of the earth. Attempts were made to develop a set of results that a system designer can use in that synthesis of a design for a specific application and in accurately predicting the performance of his synthesized design. A detailed analysis of the randomly excited signal tracking loop was performed to obtain analytical results for the tracking precision. Analytical models for the random process input to the tracking loop and for the tracking loop were developed and analyzed. Analytical and numerical results for the mean, covariance, and probability density functions of various processes in the input process model are presented for different system parameter values. Equivalent feedback loop models for the tracking loop were developed. Dissert. Abstr.

N74-30889 Utah Univ., Salt Lake City.
ROCKET CHAMBER TEMPERATURE MEASUREMENTS BY MICROWAVE TECHNIQUES Ph.D. Thesis
James Lih Hou 1974 160 p
Avail: Univ. Microfilms Order No. 74-17965

Microwave attenuation techniques are used to find the combustion chamber temperature of a solid rocket motor, and the predicted value calculated by a theoretical specific impulse computer program and the value calculated with the microwave measurements agree within three percent. The propellants used in this investigation were seeded with five percent potassium perchlorate by weight to furnish enough electrons in the plasma to cause measurable attenuation. The propellants were also seeded with 5 to 10 percent aluminum to produce suspended metallic particles in the plasma.The temperature profile inside the combustion chamber is determined for a distance of two inches away from the burning surface by scanning the focused microwave signal transverse to the combustion chamber and by utilizing the motion of the burning surface with respect to the antennas.
Dissert. Abstr.

N74-30890 British Library Lending Div., Boston Spa (England).
SUITABILITY OF A SYPHON TYPE FLOW-METER FOR HIGH-SPEED LIQUID CHROMATOGRAPHY
G. Rossler, W. Schneider, and I. Halasz 14 Feb. 1974 6 p refs Transl. into ENGLISH from Chromatographia (West Germany), v. 6, no. 5, May 1973 p 237-238
(BLL-Trans-884-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The suitability of a syphon type flow-meter for high speed liquid chromatography was evaluated. The reproducibility of the volume measurements is of the same order of magnitude as that of the high pressure pump (approximately 1%). The influence of the physical properties of the elutrients is about the same.
Author

N74-30891*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Lockheed Solar Observatory.
THE SPECTRA SPECTROHELIOGRAPH SYSTEM, SECTION 1 Final Report
A. M. Title May 1974 61 p refs
(Contract NAS8-28018)
(NASA-CR-120376; LMSC-D402244-Sect-1) Avail: NTIS HC $6.25 CSCL 14B

A system capable of producing maps of the magnetic field straight from spectra was created. The theory of the extraction of magnetic field information by Fourier transform techniques is discussed. Contour maps of a high gradient magnetic field region are presented.
Author

N74-30892*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Lockheed Solar Observatory.
OPERATORS MANUAL FOR THE MAGNETOGRAPH PROGRAM (SECTION 2) Final Report
Larry November and A. M. Title May 1974 73 p
(Contract NAS8-28018)
(NASA-CR-120377; LMSC-D402244-Sect-2) Avail: NTIS HC $6.75 CSCL 14B

This manual for use of the magnetograph program describes: (1) black box use of the programs; (2) the magtape data formats used; (3) the adjustable control parameters in the program; and (4) the algorithms. With no adjustments on the control parameters this program may be used purely as a black box. For optimal use, however, the control parameters may be varied. The magtape data formats are of use in adopting other programs to look at raw data or final magnetograph data.
Author

N74-30893*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Lockheed Solar Observatory.
OPERATORS MANUAL FOR MICRODENSITOMETER CONTROL PROGRAM DENSITOMETER MODEL PDS-1010G (MODIFIED). PROGRAM TRACE VERSION 3B (SECTION 3) Final Report
A. M. Title May 1974 97 p
(Contract NAS8-28018)
(NASA-CR-120378; LMSC-D402244-Sect-3) Avail: NTIS HC $8.00 CSCL 14B

The PDS-1010G microdensitometer is run under the control of a PDP-11 program called TRACE. This program gives the operator vary flexible control over the machine functions. Most commands are passed to the computer through either the Tektronix 4010 terminal or the teletype, as selected by the position of the LOCAL/LINE rocker switch above the 4010 keyboard. (LINE places the 4010 in control; LOCAL transfers control to the teletype. In general, the teletype is used when the operator desires a permanent record of the operator-computer dialogue.) A small number of control functions are requested by setting switches on the computer front panel. Author

N74-30894*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METHOD AND APPARATUS FOR TENSILE TESTING OF METAL FOIL Patent Application
Orval W. Wade, inventor (to NASA) (Martin Marietta Corp.) Filed 27 Jun. 1974 14 p Sponsored by NASA
(NASA-Case-LAR-10208-1; US-Patent-Appl-SN-483858) Avail: NTIS HC $4.00 CSCL 14B

A method is described whereby accurate, reproducible results are obtained in the tensile testing of thin metal foils. The method consists of working the side edges of the test specimen until the edges are parallel and flaw-free, aligning the work specimen between space grip end members, and securing end portions of the aligned test specimen to the grip end members. An aligning apparatus employed in the method consists of an alignment box having a longitudinal bottom wall and two upright side walls with the first and second removable grip end members disposed at each end of the box, and with a means for securing the grip end members within the box. The grip end members are provided with means for receiving opposite end portions and aligning the test specimen. NASA

N74-30895*# Arizona Univ., Tucson. Optical Sciences Center.
STUDY OF AN INSTRUMENT FOR SENSING ERRORS IN A TELESCOPE WAVEFRONT Final Report
L. J. Golden, R. V. Shack, and P. N. Slater May 1974 174 p refs
(Contract NAS8-27863)
(NASA-CR-120353) Avail: NTIS HC $11.75 CSCL 14B

Focal plane sensors for determining the error in a telescope wavefront were investigated. The construction of three candidate test instruments and their evaluation in terms of small wavefront error aberration measurements are described. A laboratory wavefront simulator was designed and fabricated to evaluate the test instruments. The laboratory wavefront error simulator was used to evaluate three tests; a Hartmann test, a polarization shearing interferometer test, and an interferometric Zernike test.
Author

N74-30896*# Scientific Translation Service, Santa Barbara, Calif.
A CONTACTLESS MEASUREMENT SYSTEM FOR CONTINUOUS RECORDING OF TEMPERATURES ON ROTATING PARTS, ESPECIALLY IN ELECTRICAL MACHINES
W. Raasch and D. Schein Washington NASA Aug. 1974 22 p refs Transl. into ENGLISH from Techn. Mitt. AEG-Telefunken (West Germany), v. 63, no. 7, 1973 p 278-284
(Contract NASw-2483)
(NASA-TT-F-15832) Avail: NTIS HC $4.25 CSCL 14B

A universal measurement system is introduced for continuous electrical and nonelectrical properties. The measurement information is transferred without contacts from rotating parts to a stationary apparatus. The system consists of an active electronic installation on the rotating parts and a stationary electronic part. Electrical signals are available at the output terminals of the electronic part which can be used for display, remote display, recording, supply of limit value indicators, further processing in process computers, etc. The system has no maintenance nor wear and is designed for continuous operation. The system is described using the example of a temperature recording installation with three independent measurement points for the Neu-Ulm network coupling transformer of the German railways. The same considerations apply for systems for collecting other electrical and nonelectrical quantities. Author

N74-30897*# National Aeronautics and Space Administration, Washington, D.C.
ANALYTICAL TECHNIQUES AND INSTRUMENTATION: A COMPILATION
[1974] 28 p refs
(NASA-SP-5957(03)) Avail: NTIS HC $1.00 CSCL 14B

Technical information is presented covering the areas of: (1) analytical instrumentation useful in the analysis of physical phenomena; (2) analytical techniques used to determine the performance of materials; and (3) systems and component analyses for design and quality control. A.L.

N74-30898*# Arizona Univ., Tucson. Optical Sciences Center.
THE DESIGN, CONSTRUCTION AND TESTING OF THE OPTICS FOR A 147-cm-APERTURE TELESCOPE
R. A. Buchroeder, L. H. Elmore, R. V. Shack, and P. N. Slater Dec. 1972 30 p refs
(NASA Order W-12885; Contract F19628-72-C-0047)
(NASA-CR-139486; TR-79) Avail: NTIS HC $4.50 CSCL 20F

Geodetic optics research for the Air Force Cambridge Research Laboratories (AFCRL) is described. The work consisted mainly of the fabrication of the optical components for a telescope with a 152-cm-diam (60-in.) primary mirror masked down to 147-cm-diam for use by the AFCRL for a lunar ranging experiment. Among the achievements of this contract were the following: completion of the primary and secondary mirrors for a high-quality 147-cm-diam telescope system in eight months from the start of edging the primary; manufacture and testing of a unique center mount for the primary according to an AFCRL design that allowed for a thin-edged and therefore less-massive mirror; and development of a quantitative analysis of the wire test for calculating the departure of the mirror figure from the design figure quickly and accurately after each polishing step. This analysis method in conjunction with a knowledge of polishing rates for given weights and diameters of tools, mirror, and polishing materials should considerably reduce the polishing time required for future large mirrors. Author

N74-30899*# Applied Science Associates, Inc., Apex, N.C.
ENGINEERING STUDIES RELATED TO THE GEOS-C RADAR ALTIMETER Final Report
L. S. Miller and G. S. Brown May 1974 95 p refs
(Contract NAS6-2307)
(NASA-CR-137462) Avail: NTIS HC $7.75 CSCL 14B

Experiment requirements, technical characteristics, and GEOS-C radar altimeter related analyses are discussed along with results of a study on engineering test data requirements. Statistical analyses related to determination of wave height

resolution achievable as a function of system characteristics and averaging period are described, in addition to a discussion on the desirability of using computer procedures to compensate for altitude tracker time-jitter. Data processing considerations for the GEOS-C system are examined. An extensive analysis of the spatial filter effect is given and results of a computation of geoidal power spectral density, based on Skylab altimeter data, is displayed and interpreted in terms of projected GEOS-C random errors. This information is then used in deriving minimum-mean-square filter procedures for both geoid undulation and slope data. The characteristics of mean received waveforms as a function of off-nadir angle are used to obtain tracker bias as a function of sea state and pointing angle. The angle estimation process proposed by the GEOS-C hardware contractor is also investigated from a standpoint of achievable angular resolution.
Author

N74-30900*# Research Triangle Inst., Research Triangle Park, N.C.
ANALYSIS OF SATELLITE ALTIMETER SIGNAL CHARACTERISTICS AND INVESTIGATION OF SEA-TRUTH DATA REQUIREMENTS Final Report
Apr. 1972 159 p refs
(Contract NAS6-1952)
(NASA-CR-137465) Avail: NTIS HC $11.00 CSCL 14B

Results are presented of analysis of satellite signal characteristics as influenced by ocean surface roughness and an investigation of sea truth data requirements. The first subject treated is that of postflight waveform reconstruction for the Skylab S-193 radar altimeter. Sea state estimation accuracies are derived based on analytical and hybrid computer simulation techniques. An analysis of near-normal incidence, microwave backscattering from the ocean's surface is accomplished in order to obtain the minimum sea truth data necessary for good agreement between theoretical and experimental scattering results. Sea state bias is examined from the point of view of designing an experiment which will lead to a resolution of the problem. A discussion is given of some deficiencies which were found in the theory underlying the Stilwell technique for spectral measurements.
Author

N74-30901# Joint Publications Research Service, Arlington, Va.
GYROSCOPES
1 Jul. 1974 13 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), no. 3, 1974 p 71-80 (JPRS-62358) Avail: NTIS HC $4.00

The forces of inertia and linear vibration on gyrocompasses and gyroscopes are reviewed. For individual titles, see N74-30902 through N74-30903.

N74-30902 Joint Publications Research Service, Arlington, Va.
ON A GENERALIZED DESIGN OF TWO-ROTOR GYROCOMPASSES
M. A. Sergeyev *In its* Gyroscopes (JPRS-62358) 1 Jul. 1974 p 1-7 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), no. 3, 1974 p 71-76 (For availability see N74-30901 20-14)

The influence of inertia on sensor behavior of two-rotor gyrocompasses is investigated. A generalized design is presented. The motion of the sensors is analyzed, considering suspension in the cardan ring of the binnacle and with the hydraulic lines disconnected. The relations are intended for computer calculation of various modification derivations of two-rotor gyrocompasses for the purpose of comparing their errors
Author

N74-30903 Joint Publications Research Service, Arlington, Va.
THE INTERACTION OF PARAMETRIC AND INDUCED OSCILLATIONS OF A GIMBAL GYROSCOPE, CAUSED BY LINEAR VIBRATION OF THE BASE DURING RESONANCE
V. I. Kopyton *In its* Gyroscopes (JPRS-62358) 1 Jul. 1974 p 8-12 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), no. 3, 1974 p 76-80 (For availability see N74-30901 20-14)

The problem is examined for gyroscope motion, whose center of mass is displaced to some point that does not coincide with the geometric suspension point. This happens when the frequency of vibration of the base is closed to the frequency of nutational oscillations.
Author

N74-30904# California Univ., Berkeley. Lawrence Berkeley Lab.
GAMMA-RAY IMAGING USING A FRESNEL ZONE PLATE APERTURE, MULTIWIRE PROPORTIONAL CHAMBER DETECTOR, AND COMPUTER RECONSTRUCTION
B. MacDonald, L. T. Chang, V. Perez-Mendez, and L. Shiraishi Nov. 1973 18 p refs Presented at Nucl. Sci. Symp., San Francisco, 14 Nov. 1973
(Contract W-7405-eng-48)
(LBL-2048; Conf-731112-27) Avail: NTIS HC $3.00

The use of the multiwire proportional chamber in a Fresnel zone plate coded aperture gamma ray imaging system is described. Image reconstruction is by computer using the fast Fourier transform algorithm. Criteria for design parameters of the imaging system are established. A calculation of the signal/noise ratio of images reconstructed from computer generated on-axis zone plate holograms gives values, for larger numbers of gamma ray events, which are somewhat smaller than theoretical values based on a shot noise formula. The use of a positive and a negative zone plate combination is shown to eliminate the large background usually associated with on-axis zone plate imaging.
Author (NSA)

N74-30905# Allied Chemical Corp., Idaho Falls, Idaho.
STACK MONITOR SYSTEM AT THE IDAHO CHEMICAL PROCESSING PLANT
R. C. Girton, L. T. Lakey, and D. T. Pence Sep. 1973 30 p refs
(Contract AT(10-1)-1375)
(ICP-1034) Avail: NTIS HC $4.00

The effluent monitoring system used to measure airborne particulate emissions from the Idaho chemical processing plant is described in detail. The efficiency of the system has been evaluated through studies of particle migration as a function of size, particulate plateout, particle size distribution, type of filter paper, flow rates, and the homogeneity of the gaseous effluents. Several deficiencies of the system have been identified and recommendations for improvement to meet present and anticipated pollution regulations are presented.
Author (NSA)

N74-30906# Brookhaven National Lab., Upton, N.Y.
INTERCOMPARISON OF AIRBORNE TRITIUM VAPOR SAMPLING METHODS AT BROOKHAVEN NATIONAL LABORATORY M.S. Thesis - Tenn. Univ., Knoxville
George Michael Marmaro Dec. 1973 66 p refs Sponsored by AEC
(BNL-18505) Avail: NTIS HC $5.50

An intercomparison study was conducted on six tritium vapor samplers. Four of these were airflow samplers: a molecular sieve tube, a silica gel tube, a mixed silica gel tube (a column of clear silica gel mixed with 10% color-indicating silica gel), and two series-connected frit bubblers. The remaining two were non-airflow samplers: a thermoelectric cooler and an open petri dish containing clear silica gel mixed with 10% color indicating silica gel. The analytical method associated with the mixed silica gel tube and the petri dish samplers incorporated a technique for direct counting of exposed silica gel in a liquid scintillation spectrometer. The usual liquid scintillation technique was employed with all other analyses. An experimental system was devised whereby known concentrations of tritium vapor in air could be produced and which would permit simultaneous testing of the samplers. The average response of most of the samplers generally indicated good accuracy, but the accompanying standard deviations demonstrated a lack of consistency and reproduceability.
Author (NSA)

N74-30907# Esso Research and Engineering Co., Linden, N.J. Government Research Lab.
VAPOR DETECTOR Final Report, 10 Oct. 1972 - 15 Nov. 1973
G. M. Varga, Jr. 15 Feb. 1974 30 p refs
(Contract DAAH01-73-C-0137)
(AD-780171; GRU.1DJAE.74; RK-CR-74-8) Avail: NTIS CSCL 07/3

It has been shown that coated piezoelectric crystals can

detect quantitatively vapors of unsymmetrical dimethyl hydrazine (UDMH) in the presence of a background level of humidity which might be encountered by a GI in the field. The UDMH levels detected ranged from 2 ppm to 115 ppm UDMH. Four crystal coatings which were found to be effective were members of the acrylonitrile-butadiene and styrene-butadiene copolymer families. Crystals coated with these polymers also monitored water vapor quantitatively. Sensor response was sufficiently rapid so that piezoelectric instrumentation could be utilized to sound an alarm for UDMH instantly and could determine the UDMH concentration quantitatively in one minute or less. It was also shown that piezoelectric instrumentation was capable of differentiating between minute differences in UDMH level such as 30 and 31 ppm UDMH. Author (GRA)

N74-30908# Utah Univ., Salt Lake City. Dept. of Civil Engineering.
A PHOTOGRAMMETRIC SYSTEM FOR MOTOR VEHICLE ACCIDENT INVESTIGATION Final Report, 27 Jun. 1971 - 27 Jun. 1973
Clifford G. Bryner Mar. 1974 97 p refs
(Contract DOT-HS-047-1-138)
(PB-231562/0; DOT-HS-801-098) Avail: NTIS HC $4.00 CSCL 14E

The study consisted of fabricating a twin camera stereometric unit mounted on a portable carrier with 36 in spacing for the camera lenses. The unit was calibrated, and its net accuracy capabilities were determined. A variety of applications were studied including: Mapping the site of the accident both on scene with evidence, and on site after evidence was removed; photographing a vehicle in an effort to determine the qualitative data (type of damage) and quantitative data (specific measurements) available for study at any time the photographs are to be reviewed; and photographing a victim of an accident seeking qualitative and quantitative data. Major emphasis centered around utilization problems and potential contributions to multidisciplinary studies. GRA

N74-30909# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE DESIGN OF A SECOND GENERATION YAWSONDE Final Report
William H. Mermagen and Wallace H. Clay Apr. 1974 32 p refs
(AD-780064; BRL-MR-2368) Avail: NTIS CSCL 19/1

Improvements have been incorporated into existing yawsonde telemeters to facilitate ground reduction of extensive quantities of data. The main area of improvement has been in the design of the amplifier so that solar pulses of constant amplitude and constant width can be transmitted to ground receiving stations. The new amplifier design makes it possible to reduce the solar pulse data on board yhe projectile itself providing solar aspect angle as a function of time of flight in binary coded form at the transmitter. Such on-board, real time motional data could be used in a command/control system to enhance the accuracy of artillery fire. Author (GRA)

N74-30910# Naval Weapons Lab., Dahlgren, Va.
CROSS TRACK VERTICAL DEFLECTION ACCURACY OF A DUAL SATELLITE ALTIMETRY SYSTEM
Cary Chen Mar. 1974 21 p refs
(AD-779821; NWL-TR-3117) Avail: NTIS CSCL 08/3

Cross track vertical deflection uncertainty of sea surface from a dual satellite radar altimeter system is investigated in this study. The representative case simulated for study is 1000 km height satellites in nearly circular polar orbits. The along track separation of the two satellites is approximately 300 km which corresponds to a cross track radar coverage of 10 minutes of arc. Using gravity field perturbation alone, it is found 2 sec relative error of deflection of vertical as most optimistic while 4 sec represents a more realistic error. The 2 sec relative error of deflection of vertical agrees well with a similar simulation study done by the Applied Physics Laboratory, Johns Hopkins University. Author (GRA)

N74-30709* Canadian Center for Remote Sensing, Ottawa (Ontario).
USER ORIENTED ERTS-1 IMAGES
Seymour Shlien and David Goodenough *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 29-40 refs (For availability see N74-30705 20-13)
(Paper-A2) CSCL 14B

N74-30820* Forest Management Inst., Ottawa (Ontario).
INTERPRETATION OF ERTS-1 IMAGERY AIDED BY PHOTOGRAPHIC ENHANCEMENT
U. Nielsen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1773-1786 (For availability see N74-30774 20-13)
(Paper-I6) CSCL 14E

N74-30826* Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
PRINCIPAL COMPONENTS COLOUR DISPLAY OF ERTS IMAGERY
M. M. Taylor *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1877-1897 refs (For availability see N74-30774 20-13)
(Paper-I12) CSCL 14E

N74-30829* Kansas Univ. Center for Research, Inc., Lawrence.
SPECTRAL AND TEXTURAL PROCESSING OF ERTS IMAGERY
R. M. Haralick and R. Bosley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1929-1969 refs (For availability see N74-30774 20-13)
(Paper-I15) CSCL 14E

N74-30830* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DIGITAL IMAGE ENHANCEMENT TECHNIQUES USED IN SOME ERTS APPLICATION PROBLEMS
Alexander F. H. Goetz and Fred C. Billingsley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1971-1992 refs (For availability see N74-30774 20-13)
(Paper-I16) CSCL 14E

N74-30851 Joint Publications Research Service, Arlington, Va.
STUDY OF TELEVISION PHOTOGRAPHS FROM SPACE: MEANS OF TECTONIC DISTRICTING
I. I. Bashilova, G. V. Makhin, and V. K. Yeremin *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 22-40 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 19-33 (For availability see N74-30847 20-13)

N74-30857 Joint Publications Research Service, Arlington, Va.
CONSIDERATION OF THE SCALE DISTORTIONS OF A SPACE PHOTOGRAPH DURING ITS INTERPRETATION
G. B. Gonin and L. I. Pogodina *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 100-104 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 81-84 (For availability see N74-30847 20-13)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-30911 British Library Lending Div., Boston Spa (England).
MEASUREMENT OF SHAFT VIBRATIONS ON TURBINE MACHINES
27 Feb. 1974 22 p refs Transl. into ENGLISH from VDI Richtlinien 2059 (West Ger.), Nov. 1972
(BLL-CE-Trans-6337-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

This standard deals with the measurement and analysis of vibrations of turbomachine shafts for the purpose of supervision during operation. It specifies some potential danger situations and formulates two measuring tasks suitable for detecting these

danger situations. Several concepts and stipulations are stated concerning bearing vibrations, the general motion of rotors, reference points and shaft vibration proper, which appear to be appropriate for describing the results of shaft vibration measurements. Recommendations for measurements include references to methods, possible measuring stations, comprehensive vibration tests and appropriate procedure of supervision during operation. Possibilities of assessing the general motion and the usefulness of qualitative conclusions from changes in the vibration characteristics compared to a normal state of operation are discussed. Finally, methods for a quantitative assessment which are available at the present time are dealt with. Author

N74-30912 British Library Lending Div., Boston Spa (England).
CARRYING OUT MECHANICAL AND THERMAL TESTS
M. Labrousse and J. Remy 27 Feb. 1974 16 p ref Transl. into ENGLISH from the Proc. of the IAEA Seminar on Test Requirements for packaging for the Transport of Radioact. Mater. (France), 1971 p 161-175
(BLL-CE-Trans-6321-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Regulations for the safe transport of radioactive materials define methods for mechanical and thermal testing to establish whether packages conform with provisions concerning type A and type B packaging. The testing station installations are described, as well as the checking and measuring devices with which the station is equipped (leak-tightness check, temperature and acceleration measurements etc.). Statistical data are given relating to tests already undertaken. Author

N74-30913 British Library Lending Div., Boston Spa (England).
SIMILARITY VALUES IN THE DECIMAL-GEOMETRIC GRADING OF AXIAL PISTON UNITS
R. Kordak [1973] 20 p refs Transl. into ENGLISH from Oelhydraulik und Pneumatik (West Germany), v. 17, no. 10, 1973 p 279-284 In ENGLISH and GERMAN
(BLL-NEL-TT-2523; BLL-LTS-1837/73/German/JL) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Sensible series planning of the main dimensions in decimal-geometric steps in accordance with the laws of similarity facilitates the design, testing and expenditure of energy per unit for axial piston units. With the completion of one size, a complete series of that type is developed, so that any new demand can be met with a suitable size. By the analysis of similarities, characteristics are derived which serve in the comparison of different types of designs. Author

N74-30914 British Library Lending Div., Boston Spa (England).
AMPLITUDE-PHASE-FREQUENCY CHARACTERISTICS OF HIGH-SPEED CENTRIFUGAL PUMP
Ya. A. Gelfandbein and N. G. Shumov 26 Feb. 1971 13 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Mashinostr. (USSR), v. 8, 1972 p 64-69 In ENGLISH and RUSSIAN
(BLL-M-23367-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The constructional and operational parameters of centrifugal pumps were estimated under industrial and control test conditions by measuring the working, cavitation, and startup characteristics of the pump. A simplified structural diagram of the pump is presented which was used to consider a method of determining the dynamic characteristics of the pump from the current value of the pressure and the flow rate, at its inlet and outlet, for two statistically independent channels. The amplitude-phase-frequency characteristics were sought in terms of the corresponding impulsive transfer functions by solving integral equations for the hydrodynamic parameters of the pump. Author

N74-30915 British Library Lending Div., Boston Spa (England).
HOW FAILURES OF ELEMENTS OF A COMPLEX SYSTEM INFLUENCE ITS FUNCTIONING
B. M. Kopelevich Jan. 1974 7 p refs Transl. into ENGLISH from Avtomat. Vychisl. Tekh. (USSR), v. 2, 1971 p 26-29
(BLL-RTS-8432) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Optimization of the prophylactic response is considered for elements of complex systems, on condition that failure of an element does not lead to system failure. The functioning of such elements is described by a semi-Markov process with three states. Author

N74-30916*+ National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUGER ATTACHMENT METHOD FOR INSULATION Patent Application
William C. Schneider, inventor (to NASA) Filed 24 Jul. 1974 11 p
(NASA-Case-MSC-12615-1; US-Patent-Appl-SN-491417) Avail: NTIS HC $4.00 CSCL 13E

An auger device is used to attach rigid surface insulation to a spacecraft. The auger is screwed into an insulation tile which has been predrilled. The augertile combination is then fastened to the spacecraft using an attachment screw which penetrates the spacecraft skin, which is secured by a blind end fastener. In an alternate method, the auger is incorporated in the insulation tile when the tile is fabricated. NASA

N74-30917 British Library Lending Div., Boston Spa (England).
TESTING TECHNIQUE FOR A WEAR SYSTEM BASED ON WEAR ANALYSIS, IN PARTICULAR THERMAL ANALYSIS
H. Uetz and J. Fohl [1974] 28 p refs Transl. into ENGLISH from VDI-Ber. (Duesseldorf), v. 194, 1973 p 57-68 In ENGLISH and GERMAN
(BLL-Risley-TR-2730-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl. 3 BLL photocopy coupons

Wear testing methods are discussed, including long term tests, model tests on reduced assemblies, and tests with high determination sensitivity. Laboratory studies were carried out, approximating the operational conditions. The interface boundary layer temperature is shown to be an important criterion for tribological processes evaluation. The difficulties involved in drawing-up a thermal model are also examined. J.A.M.

N74-30918 British Library Lending Div., Boston Spa (England).
INSTRUCTIONS FOR PRESERVING EQUIPMENT USED IN POWER STATIONS
E. N. Ivanov 28 Dec. 1973 40 p Transl. into ENGLISH from Energiya (Moscow), 1972 52 p
(BLL-CE-Trans-6149-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Methods of preservation are discussed including the choice of the method of preservation, and the principal systems of preservation. The preservation of drum and one-through boilers by maintaining an overpressure, by using sodium nitrate and ammonia, hydrazine and ammonia, and nitrogen is considered. Author

N74-30919 British Library Lending Div., Boston Spa (England).
SPECIFIC ENERGY AND POSITIVE SUCTION ENERGY OF A CENTRIFUGAL PUMP AT VARIOUS DEGREES OF SURFACE ROUGHNESS ON THE IMPELLER
H. Komessa 4 Feb. 1974 8 p refs Transl. into ENGLISH from Ind.-Anz. (West Germany), issue 95, no. 101, 30 Nov. 1973 p 2381-2383 In ENGLISH and GERMAN
(BLL-NEL-TT-2533-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The dependence of the specific energy, the efficiency and the positive suction energy of a pump on the peak-to-valley height of the impeller channels was examined. In general the results already known from documentation and expected tendencies were confirmed. What is surprising however is the extent of the falling-off of specific energy and efficiency with a growth in roughness. Author

N74-30920 British Library Lending Div., Boston Spa (England).
WEAR RESISTANT METALLIC CAST MATERIALS
W. Wahl [1974] 42 p refs Transl. into ENGLISH from VDI-Berichte, no. 194, 1973 p 79-94 In ENGLISH and GERMAN
(BLL-Risley-TR-2731-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

The reduction of wear in machine parts by use of suitable cast materials is discussed along with methods for reducing the costs of loss production. Notch, grinding, and erosion wear are

described. Wear-resistant cast materials, heat treatment, and steel alloys are also discussed. F.O.S.

N74-30921*# Hydronautics, Inc., Laurel, Md.
DESIGN AND TESTING OF A TANDEM ROW PUMP INDUCER
Robert J. Etter Mar. 1974 109 p refs
(Contract NAS8-26591)
(NASA-CR-120374; TR-7117-1) Avail: NTIS HC $8.50 CSCL 13K

The design and testing of a tandem row pump inducer having a supercavitating first stage with a 0.60 hub ratio is presented. The second stage tested was a helical impeller with a 0.70 hub ratio. A cubic arc transition was utilized to accomplish the hub change. The first stage had two blades and the free-vortex design approach was empirically modified based on previous experience. The recommended second stage design having four blades and using cambered blade section is presented but the model was not built or tested. The more simple helix was built instead to reduce cost. Data taken included head generation, cavitation observations and unsteady head fluctuations over the 0-100Hz range. Author

N74-30922*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROCEEDINGS OF THE SYMPOSIUM ON WELDING, BONDING, AND FASTENING
Bland A. Stein, comp. and John D. Buckley, comp. Dec. 1972 743 p refs Proc. held at Williamsburg, Va., 30 May - 1 Jun. 1972, sponsored by NASA, George Wash. Univ., and Am. Soc. for Metals
(NASA-TM-X-70269) Avail: NTIS HC $40.25 CSCL 13E

Various technological processes to achieve lightweight reliable joining systems for structural elements of aircraft and spacecraft are considered. Joining methods, combinations of them, and nondestructive evaluation and quality assurance are emphasized. For individual titles, see N74-30923 through N74-30957.

N74-30923* United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
SPOT-WELD BONDING ON THE BLACKHAWK HELICOPTER
Michael J. Salking *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 6 p refs (For availability see N74-30922 20-15)
CSCL 13H

The Sikorsky S-67 Blackhawk attack helicopter utilizes spot-weld bonding for stringer to skin attachment on more than 5 per cent of its surface area. It is the first American aircraft to utilize spot weld bonding, although the process has been used for some years in the U.S.S.R. The process consists of applying adhesive on the surfaces to be joined, spot welding through the adhesive, then curing the adhesive. Author

N74-30924* Grumman Aerospace Corp., Bethpage, N.Y.
ELECTRON BEAM WELDING OF AIRCRAFT STRUCTURES
R. H. Witt *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 36 p (For availability see N74-30922 20-15)
CSCL 13I

Requirements for advanced aircraft have led to more extensive use of titanium alloys and the resultant search for joining processes which can produce lightweight, high strength airframe structures efficiently. As a result, electron beam welding has been investigated. The following F-14A components are now being EB welded in production and are mainly annealed Ti-6Al-4V except for the upper wing cover which is annealed Ti-6Al-6V-2Sn: F-14A wing center section box, and F-14A lower and upper wing covers joined to wing pivot fitting assemblies. Criteria for selection of welding processes, the EB welding facility, development work on EB welding titanium alloys, and F-14A production and sliding seal electron beam welding are reported. Author

N74-30925* Martin Marietta Aerospace, Denver, Colo.
THE EFFECT OF WELD STRESSES ON WELD QUALITY
R. A. Chihoski *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 22 p refs (For availability see N74-30922 20-15)
CSCL 13H

A narrow heat source raises the temperature of a spot on a solid piece of material like metal. The high temperature of the spot decreases with distance from the spot. This is true whether the heat source is an arc, a flame, an electron beam, a plasma jet, a laser beam, or any other source of intense, narrowly defined heat. Stress and strain fields around a moving heat source are organized into a coherent visible system. It is shown that five stresses act across the weld line in turn as an arc passes. Their proportions and positions are considerably altered by weld parameters or condition changes. These pushes and pulls affect the metallurgical character and integrity of the weld area even when there is no apparent difference between after-the-fact examples. Author

N74-30926* Boeing Co., Seattle, Wash.
TITANIUM HONEYCOMB STRUCTURE **c02**
R. A. Davis, S. D. Elrod, and D. T. Lovell *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 21 p (For availability see N74-30922 20-15)
CSCL 01C

A brazed titanium honeycomb sandwich system for supersonic transport wing cover panels provides the most efficient structure spanwise, chordwise, and loadwise. Flutter testing shows that high wing stiffness is most efficient in a sandwich structure. This structure also provides good thermal insulation if liquid fuel is carried in direct contact with the wing structure in integral fuel tanks. Author

N74-30927* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECTS OF HIGH-TEMPERATURE BRAZING AND THERMAL CYCLING ON THE MECHANICAL PROPERTIES OF HASTELLOY X **c17**
Dennis L. Dicus and John D. Buckley *In its* Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 23 p refs (For availability see N74-30922 20-15)
CSCL 11F

Data are presented on the effects of brazing alloy, brazing operation, thermal cycling, and combinations of these on the yield strength, elongation, tensile strength, and fatigue life of thin gage Hastelloy X. These data show that brazing at 1461 K (2170 F) with a Ni-Pd-Au alloy and subsequent exposure to 200 service thermal cycles between 533 and 1144 K (500 and 1600 F) result in reduction of as much as 39 percent in yield strength, 33 percent in elongation, 14 percent in tensile strength, and 26 percent in fatigue limit of Hastelloy X, as compared to as-received materials. These property losses are primarily caused by the brazing operation rather than the subsequent service thermal cycles. Author

N74-30928* Lockheed-Georgia Co., Marietta.
DEVELOPMENT OF THE WELDBOND PROCESS FOR JOINING TITANIUM
D. Fields *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 18 p (For availability see N74-30922 20-15)
(Contract F33615-71-C-1099)
CSCL 13H

High quality resistance spot welds were produced by welding through epoxy adhesive on titanium alloys. Weldbond joints were consistently stronger than those of either mechanical fasteners, structural adhesive bonds, or mechanical fasteners with adhesive at the joint interface. Weldbond joints and/or spot weld joints showed superior strength at all temperature ranges as compared to other joints tested. Author

N74-30929* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WELD-BRAZING - A NEW JOINING PROCESS
Thomas T. Bales, Dick M. Royster, and Winfrey E. Arnold, Jr. *In its* Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 22 p refs (For availability see N74-30922 20-15)
CSCL 13H

A joining process designated weld brazing which combines resistance spot welding and brazing has been developed.

Resistance spot welding is used to position and align the parts as well as to establish a suitable faying surface gap for brazing. Fabrication is then completed by capillary flow of the braze alloy into the joint. The process has been used successfully to fabricate Ti-6Al-4V titanium alloy joints using 3003 aluminum braze alloy. Test results obtained on single overlap and hat-stiffened structural specimens show that weld brazed joints are superior in tensile shear, stress rupture, fatigue, and buckling than joint fabricated by spotwelding or brazing. Another attractive feature of the process is that the brazed joints is hermetically sealed by the braze material. Author

N74-30930* Northrop Corp., Hawthorne, Calif. Materials Research Lab.
THIN-FILM DIFFUSION BRAZING OF TITANIUM ALLOYS c17
E. B. Mikus *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 33 p (For availability see N74-30922 20-15)
CSCL 11F

A thin film diffusion brazing technique for joining titanium alloys by use of a Cu intermediate is described. The method has been characterized in terms of static and dynamic mechanical properties on Ti-6Al-4V alloy. These include tensile, fracture toughness, stress corrosion, shear, corrosion fatigue, mechanical fatigue and acoustic fatigue. Most of the properties of titanium joints formed by thin film diffusion brazing are equal or exceed base metal properties. The advantages of thin film diffusion brazing over solid state diffusion bonding and brazing with conventional braze alloys are discussed. The producibility advantages of this process over others provide the potential for producing high efficiency joints in structural components of titanium alloys for the minimum cost. Author

N74-30931* United Aircraft Corp., East Hartford, Conn. Research Labs.
HIGH POWER LASER WELDING
Conrad M. Banas *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 22 p refs (For availability see N74-30922 20-15)
CSCL 13H

A review of recent developments in high power, carbon dixoide laser welding is presented. Deep penetration welding in stainless steel to 0.5-in. thick, high speed welding in thin gage rimmed steel and gas shielded welding in Ti-6Al-4V alloy are described. The effects of laser power, power density, focusing optics, gas-shielding techniques, material properties and weld speed on weld quality and penetration are discussed. It is shown that laser welding performance in thin materials is comparable to that of electron beams. It is further shown that high quality welds, as evidenced by NDT, mechanical and metal-logographic tests, can be achieved. The potential of the laser for industrial welding applications is indicated. Author

N74-30932* Boeing Co., Seattle, Wash. Commercial Airplane Group.
INTRODUCTION TO THE ADHESIVE BONDING SESSION
J. E. McCarty *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 2 p (For availability see N74-30922 20-15)
CSCL 13H

Space shuttle unique requirements call for the development of a specific adhesive system to reliable attach reusable surface insulation. A low density foam system has been developed that provides strain isolation from the support structure and remains structurally stable in space shuttle thermal environment. Surface preparation and its stabilization by an adhesive primer system are the most important factors in preventing corrosion from reducing the reliability and durability of the adhesive bonding component. Author

N74-30933* General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
ADHESIVE BONDING AND THE USE OF CORROSION RESISTANT PRIMERS
Ralph R. Hockridge and H. G. Thibault *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 16 p refs (For availability see N74-30922 20-15)
CSCL 13H

The use of an anti-corrosive primer has been shown to be essential to assure survival of a bonded structure in a hostile environment particularly if a stress is to be applied to the adhesively bonded joint during the environmental exposure. For example, the Lockheed L-1011 TriStar assembly, after exhaustive evaluation tests specifies use of chromate filled inhibitive polysulfide sealants, and use of corrosion inhibiting adhesive primers prior to structural bonding with film adhesive. Author

N74-30934* Boeing Co., Seattle, Wash.
RESIDUAL THERMAL STRESS CONTROL IN COMPOSITE REINFORCED METAL STRUCTURES c32
J. B. Kelly and R. R. June *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 26 p refs (For availability see N74-30922 20-15)
(Contract NAS1-8858)
CSCL 20K

Advanced composite materials, composed of boron or graphite fibers and a supporting matrix, make significant structural efficiency improvements available to aircraft and aerospace designers. Residual stress induced during bonding of composite reinforcement to metal structural elements can be reduced or eliminated through suitable modification to the manufacturing processes. The most successful method employed during this program used a steel tool capable of mechanically loading the metal component in compression prior to the adhesive bonding cycle. Compression loading combined with heating to 350 F during the bond cycle can result in creep deformation in aluminum components. The magnitude of the deformation increases with increasing stress level during exposure to 350 F. Author

N74-30935* General Electric Co., Philadelphia, Pa. Plastics and Advanced Composites Lab.
BONDING OF REUSABLE SURFACE INSULATION WITH LOW DENSITY SILICONE FOAMS
Arnold A. Hiltz, Ralph R. Hockridge, and Fred P. Curtis *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 28 p (For availability see N74-30922 20-15)
(Contracts NAS1-10533; NAS9-12084)
CSCL 13H

The development and evaluation of a reduced density, high reliable foamed bond strain isolation system for attaching reusable surface insulation to the space shuttle structure are reported. Included are data on virgin materials as well as on materials that received 100 cycles of exposure to 650 F for approximately 20 minutes per cycle. Room temperature vulcanizing silicon elastomers meet all the requirments for an adhesive bonding system. Author

N74-30936* Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN OF BONDED JOINTS IN COMPOSITE MATERIALS c18
N. Corvelli *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 4 p refs (For availability see N74-30922 20-15)
CSCL 11D

The primary form of joining high strength advanced composite materials is adhesive bonded joints. The stepped bonded joint is an efficient configuration where the adhesive and composite matrix are co-cured. A design procedure for this type of joint is described along with the analysis technique upon which it is based. A modified elastic analysis accounts for the nonlinear behavior of the adhesive. A computer program with minimum running time and simplified input is utilized for analysis and becomes an efficient link in an iterative design procedure. Comparisons between analytical results and test results are shown. Material properties which are needed for design and methods of measuring these properties are discussed. Author

N74-30937* Martin Marietta Corp., Orlando, Fla.
ADHESIVES AND THE ATS SATELLITE c31
Frank E. Hancock *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 8 p (For availability see N74-30922 20-15)
CSCL 22B

Adhesives in the ATS satellite allow the designers to save

weight, simplify design and fabrication and provide thermal and electrical conductivity or resistivity as required. The selections of adhesives are restricted to those few which can pass rigorous outgassing tests in order to avoid contaminating lenses and thermal control surfaces in space. An epoxy adhesive is used to construct the honeycomb panels which constitute most of the satellite's structure. General purpose epoxy adhesives hold doublers and standoffs in place and bond the truss to its fittings. Specialized adhesives include a high temperature resistant polyamide, a flexible polyurethane and filled epoxies which conduct heat or electricity. Author

N74-30938* Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
STRESS WAVE RIVETING
Basil P. Leftheris *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 14 p refs (For availability see N74-30922 20-15)
CSCL 13H

The stress wave riveter deforms the rivet material by a high amplitude stress wave. Thus, the entire rivet is set in motion radially. The rivet expands rapidly and impacts the hole surface before the rivet tail begins to form. Unlike the oversqueezed rivets, therefore, it sets up uniform interference without distortion in the skins. Furthermore, the radial velocity is so high (over 200 in./sec) that upon impact with the hole surface it deforms the surface plastically. This is especially effective in aluminum skins. Thus the SWR combines the advantages of plastically deforming the hole and the economic advantage of a relatively nonprecision hole and inexpensive rivets like those used in oversqueezing. The additional advantage SWR offers is that it is a portable tool. Author

N74-30939* North American Rockwell Corp., Canoga Park, Calif. Space Div.
THE BI-COMPOSITE TRANSITION JOINT
K. C. Dullea, Jr. *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 21 p (For availability see N74-30922 20-15)
(SD72-SH-0051) CSCL 11D

The application of advanced composite materials to high performance structure frequently results in the desire to fabricate a structure from more than one composite system in order to tailor the composite material capabilities to the design requirements. The bi-composite transition provides a means of joining two different composite structural systems without the weight and complexity of mechanical attachments. The monolayer plies or combinations of plies of one composite system are interleaved with and bonded to the plies of the adjacent composite system, thereby providing a direct load transfer between the two composite structures. Author

N74-30940* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SMALL-SCALE EXPLOSIVE SEAM WELDING
Laurence J. Bement *In its* Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 36 p refs (For availability see N74-30922 20-15)
(L-8323) CSCL 13H

A unique small scale explosive seam welding technique is reported that has successfully joined a variety of aluminum alloys and alloy combinations in thicknesses to 0.125 inch, as well as titanium in thicknesses to 0.056 inch. The explosively welded joints are less than one-half inch in width and apparently have no long length limitation. The ribbon explosive developed in this study contains very small quantities of explosive encased in a flexible thin lead sheath. The evaluation and demonstration of this welding technique was accomplished in three phases: evaluation and optimization of ten major explosive welding variables, the development of four weld joints, and an applicational analysis which included photomicrographs, pressure integrity tests, vacuum effects, and fabrication of some potentially useful structures in aluminum and titanium. Author

N74-30941* Worcester Polytechnic Inst., Mass.
DIFFUSION BONDING OF IN 718 TO VM 350 GRADE MARAGING STEEL
Stephen R. Crosby, Ronald R. Biederman, and Charles C. Reynolds *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 27 p refs (For availability see N74-30922 20-15)
CSCL 13H

Diffusion bonding studies have been conducted on IN 718, VM 350 and the dissimilar alloy couple, IN 718 to maraging steel. The experimental processing parameters critical to obtaining consistently good diffusion bonds between IN 718 and VM 350 were determined. Interrelationships between temperature, pressure and surface preparation were explored for short bending intervals under vacuum conditions. Successful joining was achieved for a range of bonding cycle temperatures, pressures and surface preparations. The strength of the weaker parent material was used as a criterion for a successful tensile test of the heat treated bond. Studies of VM-350/VM-350 couples in the as-bonded condition showed a greater yielding and failure outside the bond region. Author

N74-30942* Bendix Corp., Southfield, Mich. Research Labs.
DIFFUSION BONDING AND ITS APPLICATION TO MANUFACTURING
W. M. Spurgeon *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 35 p (For availability see N74-30922 20-15)
CSCL 13H

In its simplest form diffusion bonding is accomplished by placing clean metal surfaces together under a sufficient load and heating. The natural interatomic attractive force between atoms transforms the interface into a natural grain boundary. Therefore, in principle, the properties of the bond area are identical to those of the parent metal. Other advantages of diffusion bonding over conventional methods of bonding include freedom from residual stresses, excessive deformation, foreign metals, or changed crystal structures. Stainless steels, nickel-base superalloys, and aluminum alloys have all been successfully joined. Complex hardware, including integrated flueric devices, jet engine servovalves, and porous woven structures have been fabricated. The processing involved is discussed, along with such theoretical considerations as the role of metal surfaces, the formation of metal contact junctions, and the mechanisms of material transport in diffusion bonding. Author

N74-30943* Quanta Welding Co., Troy, Mich.
ULTRAPULSE WELDING: A NEW JOINING TECHNIQUE
David G. Anderson *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 22 p (For availability see N74-30922 20-15)
CSCL 13H

The ultrapulse process is a resistance welding process that utilizes unidirectional current of high magnitude for a very short time with a precisely controlled dynamic force pulse. Peak currents of up to 220,000 amperes for two to ten milliseconds are used with synchronized force pulses of up to nine thousand pounds. The welding current passing through the relatively high resistance of the interface between the parts that are being joined results in highly localized heating. Described is the UPW process as it applies to the automotive industry. Author

N74-30944* Airco Welding Products, Murray Hill, N.J. Filler Metals Research and Development Dept.
FACTORS AFFECTING THE STRENGTH OF MULTIPASS LOW-ALLOY STEEL WELD METAL
Boris M. Krantz *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 35 p refs (For availability see N74-30922 20-15)
(Contract NObs-94535)
CSCL 13H

The mechanical properties of multipass high-strength steel weld metals depend upon several factors, among the most important being: (1) The interaction between the alloy composition and weld metal cooling rate which determines the as-deposited microstructure; and (2) the thermal effects of subsequent passes on each underlying pass which alter the original microstructure. The bulk properties of a multipass weld are therefore governed by both the initial microstructure of each weld pass and its subsequent thermal history. Data obtained for a high strength low alloy steel weld metal confirmed that a simple correlation

exists between mechanical properties and welding conditions if the latter are in turn correlated as weld cooling rate. Author

N74-30945* Naval Ship Research and Development Center, Annapolis, Md.
EXTENDED ELECTRODE TECHNIQUE
Vicent D. Schaper and Abraham Pollack *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 28 p refs (For availability see N74-30922 20-15)
CSCL 13H

The extended electrode technique is a unique welding process which utilizes manual gas-metal-arc (GMAW) semi-automatic equipment and close, square butt joints to effectively produce a weld. The technique takes advantage of the resistance heating of the electode extension to effect the root pass. Weldments as large as 72-X30-X2-inch have been fabricated with this technique under normal shipyard welding conditions. Mechanical properties and explosion bulge tests indicate that satisfactory results are obtained with this process. Potential savings of approximately 50 percent can be achieved in flat welding and repair of heavy structural steel members. Author

N74-30946* Arcos Corp., Philadelphia, Pa.
ELECTROSLAG AND ELECTROGAS WELDING
Hallock C. Campbell *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 19 p (For availability see N74-30922 20-15)
CSCL 13H

These two new joining methods perform welding in the vertical position, and therein lies the secret of their impressive advantages in material handling, in weld preparation, in welding speed, in freedom from distortion, and in weld soundness. Once the work has been set in the proper vertical position for welding, no further plate handling is required. The molten filler metal is held in place by copper shoes or dams, and the weld is completed in one pass. Author

N74-30947* Air Force Materials Lab., Wright-Patterson AFB, Ohio.
ADVANCED FUSION WELDING PROCESSES, SOLID STATE JOINING AND A SUCCESSFUL MARRIAGE
Fred R. Miller *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 46 p refs (For availability see N74-30922 20-15)
CSCL 13H

Joining processes for aerospace systems combine fusion welding and solid state joining during production of metal structures. Detailed characteristics of electron beam welding, plasma arc welding, diffusion welding, inertia welding and weldbond processes are discussed. G.G.

N74-30948* Lincoln Electric Co., Cleveland, Ohio.
SUBMERGED ARC WELDING OF HEAVY PLATE
Robert A. Wilson *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 19 p (For availability see N74-30922 20-15)
CSCL 13H

The submerged arc process is particularly suitable for heavy plate welding because of its ability to combine very high deposit rates along with excellent quality. It does these things without the smoke and spatter often accompanying other processes. It is available today in several forms that are pointed to the fabricators of heavy sections with long, short or round about welds. Tandem arc full automatic equipment is particularly suitable for those long heavy welds where speed and deposit rate are of the first order. An attachment called long stick-out which makes use of the IR drop on long electrode extensions can be included on this equipment to increase deposition rates 50% or more. Author

N74-30949* North Carolina State Univ., Raleigh.
ELECTROSLAG WELDING OF 75 TO 100 TON INGOTS
Charles R. Manning, Jr. *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 16 p (For availability see N74-30922 20-15)
CSCL 13H

A new process for joining large cross-section components by electroslag welding is reported that utilizes four consumable electrodes made of the same material as the ingots. A bifilar current supply provides the very large energy input to the consumerable nozzle for heating the ingots being welded. This process produces better and more homogeneous mechanical properties, better chemical composition and structure uniformity, and requires no prior or simultaneous heating of ingots during welding. It is now possible to obtain medium size ingots and join as many as are required to produce 500 or 600 ton ingots. G.G.

N74-30950* General Electric Co., Philadelphia, Pa.
SUMMARY OF THE NONDESTRUCTIVE EVALUATION SESSION
R. C. Stinebring *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 1 p (For availability see N74-30922 20-15)
CSCL 13H

Advanced material systems and deigns require improved nondestructive evaluation (NDE) techniques for quality control, failure analysis and properties monitoring. Some advanced NDE techniques such as infrared scanning systems, laser holographic applications and the use of the Mossbauer effect are outlined. Applications of these techniques are discussed for evaluating the new space shuttle external insulation materials, aircraft structures and engine components, and precursors to crack initiation and growth. Author

N74-30951* General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
SPECIAL NONDESTRUCTIVE TECHNIQUES FOR EVALUATING SPACE SHUTTLE SURFACE INSULATION c18
R. C. Stinebring *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 12 p (For availability see N74-30922 20-15)
CSCL 11D

NDT techniques have been developed for performing in-process evaluations for material variability and for process control. Several of these techniques show considerable promise for evaluating the reusable surface insulation during the operational phase of the shuttle. Considered are radiographic dosimetry, sonic velocity and modulus sounding, infrared coating evaluation, and beta backscatter monitoring of coating thickness. Author

N74-30952* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MOSSBAUER EFFECT AND ITS APPLICATIONS IN MATERIALS RESEARCH c26
Jag. J. Singh *In its* Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 19 p refs (For availability see N74-30922 20-18)
CSCL 20L

It is generally recognized that in any well behaved metal fatigue failure, the following sequence of events occurs. The application of stress causes the movement of defects already present in the specimen, besides producing new defects. These defects concentrate in the regions of stress concentration. This defect concentration, which precedes crack nucleation and its eventual growth, actually amounts to environmental changes for Mossbauer atoms located in these regions. Changes in the atomic composition of the Mossbauer absorber atom environment are sensed by examining changes in the sensitive parameters of the Mossbauer spectra. A preliminary study of changes in the isomer shift and line width of commercial nonmagnetic steel specimen is reported. Author

N74-30953* General Electric Co., Schenectady, N.Y.
TRENDS IN MECHANICAL FASTENERS
Jack B. Levy *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 16 p (For availability see N74-30922 20-15)
CSCL 13E

Some of the specialty fasteners which are enjoying increasing usage are: thread rolling screws, self drilling and tapping screws, locking screws, tamperproof fasteners, and flanged bolts and nuts. The development of an optimum metric fastener system is recommended for future fastener manufacturing. G.G.

N74-30954* Boeing Co., Seattle, Wash. Commercial Airplane Group.
TITANIUM FASTENERS
Joseph L. Phillips *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 16 p (For availability see N74-30922 20-15)
CSCL 13E

Titanium fasteners are used in large quantities throughout the aircraft industry. Most of this usage is in aluminum structure; where titanium structure exists, titanium fasteners are logically used as well. Titanium fasteners offer potential weight savings to the designer at a cost of approximately $30 per pound of weight saved. Proper and least cost usage must take into consideration type of fastener per application, galvanic couples and installation characteristics of protective coatings, cosmetic appearance, paint adhesion, installation forces and methods available and fatigue performance required. Author

N74-30955* Grumman Aircraft Engineering Corp., Bethpage, N.Y.
FASTENING ON THE F-14A FOR COST EFFECTIVE FATIGUE RESISTANCE c02
Bernard H. Beal *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 20 p refs (For availability see N74-30922 20-15)
CSCL 01C

Cost effectiveness airframe considerations dictated a variable geometry wing design that requires weight optimization, maximum working stress resistance and minimum fatigue concentration factors. The extensive use of titanium structural materials employed electron beam welding methods and interference fit fastening techniques as principle mechanical joining means for economic F-14A production and reliability engineering. G.G.

N74-30956* Aluminum Co. of America, New Kensington, Pa. Alcoa Research Labs.
THE ALCOA RAM FASTENER: A REUSABLE BLIND RIVET
W. J. Dewalt *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 21 p (For availability see N74-30922 20-15)
CSCL 13E

Results of tensile, shear, fatigue and accelerated weathering tests are presented for the ram fastener, a reusable, single unit blind rivet. The effects of variations in hole size, grip length and sheet thickness on strength properties of the fastener were determined. The test results show these fasteners to have strength characteristics suitable for light structural applications. Exposure to accelerated weathering did not impair their performance. Author

N74-30957* Standard Pressed Steel Co., Jenkintown, Pa.
MECHANICAL FASTENERS FOR 1800 F AND ABOVE
Thomas A. Roach *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 9 p (For availability see N74-30922 20-15)
CSCL 13E

The state-of-the-art of mechanical fasteners is reviewed for 1800 F and above. Some of the problems associated with the use of these fasteners are discussed in view of the projected requirements of the space shuttle for metallic heal shields which would be reusable for 100 cycles of orbit and reentry. Author

N74-30958# Technische Universitaet, Brunswick (West Germany).
THEORETICAL AND EXPERIMENTAL STUDIES ON RAPID ROLLER BEARINGS Ph.D. Thesis [THEORETISCHE UND EXPERIMENTELLE UNTERSUCHUNGEN AN SCHNELLAUFENDEN ZYLINDERROLLENLAGERN]
Friedrich Tessenow 1973 167 p refs In GERMAN
Avail: NTIS HC $11.50

Studies were conducted to determine the characteristics of various types of antifriction bearings operating at high speeds. Diagrams of the forces involved based on pressure buildup of the lubrication film and internal friction drag are developed. Mathematical models are presented to show the method of calculating the forces involved. The test equipment is described and the performance of specific types of bearings are plotted. Author

N74-30959# Technische Hochschule, Munich (West Germany).
ON THE SPUTTERING MECHANISM BY LIGHT IONS IN THE keV ENERGY REGION Ph.D. Thesis [UEBER DEN MECHANISMUS DER ZERSTAEUBUNG DURCH LEICHTE IONEN IM keV ENERGIEBEREICH]
Rudolf Weissmann 1973 35 p refs In GERMAN
Avail: NTIS HC $4.75

Film thickness measurements by Rutherford scattering are used to determine the effectiveness of sputter production of thin copper films by vertical impinging protons at 33 to 150 keV energies. Copper films are deposited on Be, V, Nb, and Ta substrates that backscatter the protons at different values. Measurements show that sputter production results are determined by the nuclear charge number of the substrate material because rejected ions contribute essentially to the scattering process. Transl. by G.G.

N74-30960*# Kanner (Leo) Associates, Redwood City, Calif.
A METHOD OF MANUFACTURING REFRACTORY MATERIALS. PATENT APPLICATION
Keisuke Shimizu Washington NASA Aug. 1974 8 p Transl. into ENGLISH of Japanese Patent Application no. 81789-1971, 29 Jun. 1973 p 499-502
(Contract NASw-2481)
(NASA-TT-F-15861) Avail: NTIS HC $4.00 CSCL 13H

A method is described for manufacturing refractory materials suitable for use as building materials, particularly internal paneling materials. Synthetic resin fiber cloth is impregnated with an alkali silicate; this is dried at 150-300 C while permitting a certain amount of foaming. Refractory materials with a moisture content of more than 75 wt% with respect to the alkali silicate are manufactured. Sheets of these refractory materials have good machinability and will not crack or warp. When exposed to heat or flames of more than 140 C, the nonwoven cloth will melt. The alkali silicates also melt before foaming. Author

N74-30961*# National Aeronautics and Space Administration, Washington, D.C.
HAND TOOLS: A COMPILATION
[1974] 26 p refs
(NASA-SP-5908(05)) Avail: NTIS HC $1.00 CSCL 13I

Technical information is provided for recent developments in hand tools for assembly and disassembly application, for materials finishing, and for inspection, analysis, and testing. Photographs or diagrams accompany each description and patent information is included with several articles. A.A.D.

N74-30962*# California State Univ., Northridge.
EXPERIMENTAL EVALUATION OF STRESSES IN SPHERICALLY HOLLOW BALLS
L. J. Nypan Washington Aug. 1974 48 p refs
(Grant NGL-05-062-002)
(NASA-CR-2445) Avail: NTIS HC $3.25 CSCL 20K

An analysis was undertaken to evaluate stresses within spherically hollow ball bearings proportioned for 40, 50, and 60% mass reductions. Strain gage rosettes were used to determine principal strains and stresses in the steel ball models statically loaded in various orientations. Dimensionless results are reported for the balls under flate plate contact loads. Similitude considerations permit these results to be applied to calculate stresses in hollow ball bearings proportioned to these mass reductions. Author

N74-30963*# National Aeronautics and Space Administration, Washington, D.C.
BONDING AND ADJOINING TECHNOLOGY: A COMPILATION Technology Utilization
[1974] 25 p
(NASA-SP-5925(03)) Avail: NTIS HC $1.00 CSCL 13H

This compilation covers NASA and AEC developed techniques covering bonding, brazing, and joining methods and technology. A.L.

N74-30964*# National Aeronautics and Space Administration, Washington, D.C.
MACHINE TOOLS AND FIXTURES: A COMPILATION Technology Utilization
[1974] 27 p
(NASA-SP-5910(05)) Avail: NTIS HC $1.00 CSCL 13I

Innovations developed by NASA, AEC, and their contractors concerning tools, adaptors, jigs, and fixtures useful in machining a wide variety of materials are presented. A.L.

N74-30965# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
X-RAY INSPECTION WITH ENHANCED IMAGES
R. W. Andrews 23 Jan. 1974 15 p
(Contract AT(29-2)-656)
(GEPP-120) Avail: NTIS HC $3.00

The use of an image enhancer to more accurately interpret radiographs is described. The instrument emphasizes the edges of images in a picture and eliminates backgrounds for easier recognition of boundaries, lines, and fine structures. Enhancement produces black or white shadows that highlight changes in photographic density. Image enhancement is used in the interpretation of radiographs for the detection of cracks and flaws, the measurement of holes, mechanical clearances, and the density of materials. Applications include the analysis of X-ray, gamma and neutron radiographs of castings, weldments, and electronic circuits. Author (NSA)

N74-30966# Sandia Labs., Albuquerque, N.Mex.
DEVELOPMENT OF MC2730 RTG THERMOPILE SIDE CONTACT ATTACHMENT PROCESS
F. G. Yost Sep. 1973 28 p refs
(Contract AT(29-1)-789)
(SLA-73-659) Avail: NTIS HC $4.00

Gold plated Kovar pads were eutectic bonded to p and n-type SiGe specimens using a 98 wt% AuSi preform alloy. This joining technique was shown to yield strong reliable bonds. A method based on this technique is described for producing bonding pads to the outermost elements of the MC2730 RTG thermopile. Author (NSA)

N74-30967# Oklahoma State Univ., Stillwater. Fluid Power Research Center.
HYDRAULICS SYSTEMS CONTROLS STUDY Annual Report, Nov. 1972 - Nov. 1973
Dec. 1973 142 p refs
(Contract DAAK02-72-C-0172)
(AD-779628; OSU-FPRC-3M2) Avail: NTIS CSCL 13/7

The purpose of the Oklahoma State University-U.S. Army Mobility Equipment Research and Development Center Program is to provide the military with tools for scientific evaluation activity generated and promulgated a number of test procedures for evaluating components like pumps, valves, cylinders, filters, etc. The present phase while continuing this work reports on efforts to evaluate total systems. A detailed account of the project activities associated with computer-aided procurement is presented in this section. The first chapter deals with system performance evaluation, and describes how a new concept in modeling--numerical representation--is used for component and system simulation. Another chapter details the work accomplished in thermal analysis of hydraulic systems. The final chapter is devoted to component service life evaluation and presents the results of various tests on hydraulic pumps, valves, and filters. (Modified author abstract) GRA

N74-30968# Dayton Univ. Research Inst., Ohio.
DIELECTROMETER MONITORED ADHESIVE BONDING Technical Report, Jun. 1970 - Oct. 1971
E. A. Arvay and P. W. Centers Mar. 1974 38 p refs
(AF Proj. 7340)
(AD-779718; AFML-TR-74-12) Avail: NTIS CSCL 13/8

An automatic dielectrometer was investigated as a means for monitoring the cure of a structural adhesive during an in-press bonding operation. The instrument was found to be sensitive to changes occurring within the adhesive, as indicated by relative values of the dielectric constant and the dissipation factor, during the bonding of metallic adherends. Insulation and shielding techniques were developed to obtain relatively noise-free dielectrometer traces while operating in the electrically noisy environment of a heated platen, hydraulic press. Definitive curves were obtained on both an epoxy type and a polyimide type adhesive system under a constantly increasing temperature cure cycle. These traces were used to design an experiment to determine the effect upon resultant-joint strength of varying the point at which full bonding pressure was applied to polyimide adhesive bonded tensile lap shear joints. Author (GRA)

N74-30969# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
ULTRASONIC PROCEDURES FOR THE DETERMINATION OF BOND STRENGTH Interim Scientific Report
Joseph L. Rose and Paul A. Meyer Jun. 1974 97 p refs
(Grant AF-AFOSR-2480-73; AF Proj. 9782)
(AD-780128; AFOSR-74-0779TR) Avail: NTIS CSCL 14/2

Theoretical wave propagation models that treat ultrasonic wave interaction with an adhesively bonded system have been developed. These models allow the selection of appropriate ultrasonic transducers for bond inspection analysis. Such problems as a variation in bondline thickness, the presence of density gradients in the adhesive bond and improper surface preparation are treated in detail. Preliminary results indicate that the potential for success appears quite high for obtaining a correlation between a bond performance parameter and some specific ultrasonic test parameter. Author (GRA)

N74-30868 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF DRILLING BOREHOLES WITH INTENSE DISTORTION
B. F. Golovchenko *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 209-215 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 164-169 (For availability see N74-30847 20-13)

N74-30869 Joint Publications Research Service, Arlington, Va.
THEORETICAL AND EXPERIMENTAL STUDIES OF THE EXHAUST SYSTEM OF A MOTORIZED DRILL
N. B. Ostapenko, V. V. Alekseyev, and I. P. Soldatov *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 216-225 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 170-177 (For availability see N74-30847 20-13)

N74-30870 Joint Publications Research Service, Arlington, Va.
DEPRECIATION NORMS FOR DRILLING EQUIPMENT AND MEANS OF IMPROVING THEM
G. Sh. Kiziriva *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 226-229 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 178-181 (For availability see N74-30847 20-13)

N74-31068 Joint Publications Research Service, Arlington, Va.
ON THE PROBLEM OF MEASUREMENTS IN AN INACCESSIBLE DOMAIN
D. G. Levchenko *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 126-129 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Polye" Novosibirsk, 1968 p 130-133 (For availability see N74-31043 20-19)

N74-31162 National Bureau of Standards, Boulder, Colo.
ACCURATE FREQUENCY MEASUREMENTS: RELEVANCE TO SOME OTHER AREAS OF METROLOGY
Helmut Hellwig and Donald Halford *In its* Time and Freq. May 1974 p 137-149 refs (For availability see N74-31155 20-23)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-30970 British Library Lending Div., Boston Spa (England).
LASER PROBES SKIES
E. Vostrukhov [1974] 4 p Transl. into ENGLISH from Izv. (USSR), 1 Sep. 1973

(BLL-M-23258-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of laser radiation to analyze the atmospheric composition as an aid to weather forecasting and pollution measurement is discussed. The construction and operation of the ground station for laser investigations are described. The laser beam makes it possible to detect the most significant accumulation of smoke and dust particles at an altitude of three to four kilometers. Author

N74-30971# Avco-Everett Research Lab., Everett, Mass.
CARBON MONOXIDE LASER Annual Technical Report
Robert E. Center May 1974 48 p refs
(Contract N00014-72-C-0030; ARPA Order 1807)
(AD-780274) Avail: NTIS CSCL 20/5

The main objective is the investigation of the pulsed electrical CO laser to determine the relevant scaling parameters and the usefulness of high power CO lasers in systems applications. The current contract has included parametric multiline/multimode performance measurements, investigation of the medium homogeneity using interferometric diagnostics, calculations of CO lineshift and linewidth as a function of pressure in CO-N2 mixtures and detailed parametric performance calculations for both single and multiline operation. The parametric performance calculations are described in an appendix to the present report and multiline outputs as well as selected multiline output. Also included in this report are some detailed lineshift calculations in CO-N2 mixtures. The shifts are predicted to be less than 0.005/cm per atmosphere N2j (Modified author abstract) Author

N74-30972# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoj Fiziki.
NEW METHODS IN SPECTRAL RESEARCH OF LIQUIDS AND SOLIDS
A. S. Davydov 1973 20 p refs In RUSSIAN
(ITF-73-150-P) Avail: AEC Depository Libraries HC $3.00

The methods for measurement of lifetimes of electronic and vibrational excitations, using laser pulses are reviewed. NSA

N74-30973# Sandia Labs., Albuquerque, N.Mex.
TELIC: A FLEXIBLE, TWO-DIMENSIONAL SIMULATION CODE FOR LASER AND ELECTRON BEAM TARGET STUDIES
F. Lane and M. Widner Feb. 1974 26 p refs
(Contract AT(29-1)-789)
(SLA-73-924) Avail: NTIS HC $3.50

A discussion of the recently developed simulation code TELIC is presented. The code is designed to efficiently solve problems which involve both thermal diffusion and hydrodynamic processes. TELIC employs two-dimensional Eulerian coordinates and has great flexibility in the choice of geometry, zoning, equation of state, and boundary conditions. Comparisons with analytic results for a diaphragm problem and numerical results obtained with the LLL LASNEX code are presented. Author (NSA)

N74-30974# Stanford Univ., Calif. Inst. for Plasma Research.
VIBRATIONAL NONEQUILIBRIUM IN CARBON DIOXIDE ELECTRIC DISCHARGE LASERS
Edward Ray Murray, Jr. Jan. 1974 151 p refs
(Contract F44620-73-C-0045; Grant NSF GK-3729; AF Proj. 9752)
(AD-779743; SU-IPR-562; AFOSR-74-0775TR) Avail: NTIS CSCL 07/4

An experimental and theoretical investigation of the vibrational nonequilibrium in a CO2 - N2 - He electric discharge was performed under strong nonequilibrium conditions. Measurements of 9.6 and 10.6 micron gain were made in a laser amplifier tube using a tuneable, spectrally pure CO2 laser and a double-beam diagnostic system. The vibrational temperature for each of the three vibrational modes of CO2 was determined experimentally from a knowledge of gain in both laser bands and from a direct measurement of the vibrational temperature of the asymmetric mode using a band reversal scheme. The transition rate and optical cross sections for the 10.6 micron band and the 9.6 micron band were measured. A theoretical performance prediction of laser gain and vibrational temperatures was made using all significant energy transfer processes. GRA

N74-30975# Naval Training Equipment Center, Orlando, Fla.
PIEZOELECTRIC LASER BEAM DEFLECTOR
George Dederian Apr. 1974 17 p refs
(NAVTRAEQUIPCEN Proj. 4742-01)
(AD-780419; NAVTRAEQUIPC-IH-233) Avail: NTIS CSCL 20/6

There has been considerable activity in an attempt to develop a practical laser deflector. The report discusses the feasibility of using a piezoelectric torsional deflector for this purpose. An introduction to piezoelectricity is given. The longitudinal, bending, and torsional modes of piezoelectric crystals are discussed using pertinent equations and figures. Author (GRA)

N74-30976# Naval Training Equipment Center, Orlando, Fla. Physical Sciences Lab.
OPTICAL EFFECT OF A SPHERICAL END PLATE ON A LASER BEAM
George Derderian May 1974 6 p
(AD-780421; NAVTRAEQUIPC-IH-236) Avail: NTIS CSCL 20/5

A mathematical analysis is presented of the deteriorationg effect of a spherical end plate on a collimated laser beam. GRA

N74-30977# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
IR WINDOW STUDIES Quarterly Technical Report
Ferdinand A. Kroger and John H. Marburger 15 Sep. 1973 75 p refs
(Contract F19628-72-C-0275; ARPA Order 2055)
(AD-780504; USCEE-457; AFCRL-TR73-0680; QTR-5) Avail: NTIS CSCL 20/5

The temperature dependence of the 10 micrometer absorption of GaAs in air shows contributions by free carriers above 250C, and surface effects due to oxidation. The dielectric constant of GaAs is found to be 12.4 plus or minus 0.12. An accurate method to determine the oxygen content of GaAs has been developed. Results obtained so far given 10 to the 17th power - 10 to the 18th power/cc or 6 x 10 to the 14th power 0 atoms per sq cm surface. Conditions favorable to the growth of thick layer GaAs have been established. Pure KCl has K approximately = 10 to the minus 4th power/cm. KBr has been purified and crystals have been grown. Analysis of the defect structure of CdTe was completed. Experimental conditions leading to high resistivity, stoichiometric material were established. Hot pressing of CdTe was started. The fundamental processes underlying multiphonon absorption were investigated. A caustic surface analysis for thermal lensing was made, and the stress and the stress fields in non-uniformly stresses windows were determined. (Modified author abstract) GRA

N74-30978# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
ELECTROSTATIC COOLING OF LASER MIRRORS AND WINDOWS Final Report, 20 Mar. 1973 - 15 Feb. 1974
K. G. Kibler and H. G. Carter, Jr. Apr. 1974 143 p refs
(Contract F29601-73-C-0057)
(AD-780103; ILIR-72-11; AFWL-TR-73-298) Avail: NTIS CSCL 20/5

Investigations have been conducted to determine the mechanism of electrostatic cooling and to optimize its application for laser mirrors and windows. Electrostatic cooling in air is found to be essentially an ionic drag phenomenon in which the convective heat transfer coefficient is proportional to the fourth root of corona current. Results on samples of ZnSe, aluminum, and CerVit, ranging from 1.5 to 4-in. diameter, indicate that convective cooling by electric probes in air is generally 10 to 15 times the natural convection cooling rate. This cooling rate may be increased by another factor of 2 if a polar gas is used instead of air. A guide for the estimation of electrostatic cooling for a prescribed system is given by a theoretically-formulated approximate equation which relates heat transfer coefficients to corona current, sample size, and gas parameters. Design recommendations for applications to laser mirrors and windows are included, and several optimization techniques are suggested. Author (GRA)

N74-30979# Army Electronics Command, Fort Monmouth, N.J.
MEASUREMENT OF Ho3+:YLF MICROMETER LASER

SPECTRAL OUTPUT VARIATIONS AND CO2 ABSORPTION COINCIDENCE
K. O. White, W. R. Watkins, and S. A. Schleusener Apr. 1974 30 p refs
(DA Proj. 1T1-61102-B-53A)
(AD-780082; ECOM-5538) Avail: NTIS CSCL 20/5

The spectral output of a multiply doped Ho3+:YLF laser in the 2.06 micrometer region was measured using a 5-m grating spectrometer. The average spectral bandwidth of the laser output was found to be 0.5 nm. The laser output varied within a 1.5-nm range about 2.0646 micrometers. (Modified author abstract) GRA

N74-30980# Mathematical Sciences Northwest, Inc., Seattle, Wash.
ELECTRON BEAM MOLECULAR LASERS Semiannual Technical Report, 15 Nov. 1972 - 15 May 1973
S. R. Byron, L. Y. Nelson, C. H. Fisher, G. J. Mullaney, and A. L. Pindroh Aug. 1973 50 p refs
(Contract N00014-72-C-0430; ARPA Order 1807)
(AD-780238; MSNW-74-105-2) Avail: NTIS CSCL 20/5

The program is directed toward developing efficient, high energy density electric discharge lasers in the infrared and visible regions of the spectrum. A high current, electron-beam-stabilized, electric discharge is used for excitation. Infrared laser emission and absorption from the vibrational levels of HF (2.8 to 3.1 micrometers) and DF (3.8 to 4.1 micrometers) in various gas mixtures is being studied to determine laser efficiency and to obtain a detailed model of the vibrational kinetics. The efficiency of electric discharge excitation of molecular vibration in these gases is being determined by solving the electron Boltzmann equation. Electronic state excitation by e-beam stabilized electric discharges in N2 and other molecular systems is being investigated in an effort to develop efficient, long pulse visible lasers. Author (GRA)

N74-30981# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPTIC QUANTUM GENERATORS
E. F. Ishchenko and Yu. M. Klimkov 22 Feb. 1974 572 p refs Transl. into ENGLISH of the book "Opticheskie Kvantovye Generatory" Moscow, 1968 p 1-470
(AD-776713; FTD-HC-23-486-74) Avail: NTIS CSCL 20/5

The main optical characteristics of radiation (monochromatism, coherence, directionality, polarization and power) are considered. Problems of the interaction of radiation and the inversion medium and optical cavities are considered and the corresponding terminology is presented. The main types of lasers (gas, solid-state and semiconductor). The principles of their action, operating principle and main parameters are described. Problems related to practical use of lasers are discussed, methods of measuring the main parameters and characteristics of lasers are described and methods, formulas and examples of calculation or estimation of the parameters of the device and selection of some its components are presented. General problems related to most applications of lasers, and also several specific examples are considered. The structure of electron shells, notations of excited states and the system of energy units used in spectroscopy are described in the appendices. GRA

N74-30982# TRW Systems Group, Redondo Beach, Calif.
H2-CI2 CHEMICAL LASER PROGRAM. PART 2: ARC JET LASER EXPERIMENT Final Report, Dec. 1972 - Dec. 1973
R. J. Reiner, G. Emanuel, J. Trost, J. Reeve, and R. A. Ackerman Jan. 1974 227 p refs
(Contract DAAH01-73-C-0446)
(AD-780176; RK-CR-74-9-Pt-2) Avail: NTIS CSCL 20/5

The authors describe work done under a program to demonstrate feasibility of a supersonic mixing laser using chain reactions of the H2-CI2 system to produce vibrationally excited HCl. This report describes the experimental setup, test procedures and hardware operation, and results of tests carried out to date. The experiment uses arc heated diluent gas to partially dissociate chlorine. Diluent plus chlorine gas flows through a two dimensional nozzle bank and then mixes with slit injected H2 as a free jet in a stable laser cavity. Three diluents (N2, He, Ar) have been used in the tests with CW laser power measured using the first two. Peak power of 27 mw was detected using He diluent. Previous theoretical analysis predicted much higher powers. The reasons for the discrepancy are discussed and future experiments are suggested. Author (GRA)

N74-30983# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
HIGH-EFFICIENCY, SINGLE-FREQUENCY LASER AND MODULATION STUDY Semiannual Technical Report
Robert C. Ohlmann, K. K. Chow, J. J. Younger, W. B. Leonard, D. G. Peterson, and J. Kannelaud 30 Sep. 1973 47 p refs
(Contract N00014-71-C-0049; ARPA Order 306)
(AD-780266; LMSC-D401776; SATR-3) Avail: NTIS CSCL 20/5

The work described in the report is the final year's effort of a three-year program to study wide bandwidth laser communications at 0.16-micrometer wavelengths. Earlier efforts of this program (during the first two years) were directed to studying the means to produce a high-efficiency, single-frequency neodymium doped yttrium aluminum garnet (Nd:YAG) laser operating at 1.06 micrometer, and to produce high-efficiency, octave-bandwidth, microwave light modulators for this wavelength. In addition, a study was also made of laser communication configurations that were suitable for very high data rates. The overall objective of this year's program, then, is to apply the results of these earlier studies to assemble a laboratory communication system that uses the entire modulation bandwidth available. In particular, the final result of this program is to be a laboratory demonstration of a laser-communication system having a bandwidth of 2 GHz. GRA

N74-30984# Northrop Corp., Hawthorne, Calif. Research and Technology Center.
HIGH POWER CO LASER Semiannual Technology Report, 1 Sep. 1973 - 28 Feb. 1974
G. L. McAllister, W. B. Lacina, D. K. Rice, and P. J. Mendoza May 1974 42 p refs
(Contract N00014-72-C-0043)
(AD-780265; NRTC-74-21R) Avail: NTIS CSCL 20/5

Effort on the High Power CO Laser Program is reviewed. The program is directed toward the development of the required CO laser technology, the required component technology, and the design and construction of intermediate power laser devices. The results of analytical and experimental investigation of the basic characteristics of the laser and data from a high pressure electrically excited CO laser device are discussed. Author (GRA)

N74-30985# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ATMOSPHERIC TRANSMISSION OF 1.06 MICRON LASER RADIATION: APPLICATION TO STANDOFF MISSILE PERFORMANCE M.S. Thesis
Charles H. Coolidge, Jr. Mar. 1974 183 p refs
(AD-779945; GEP/PH/74-4) Avail: NTIS CSCL 20/6

A model for the prediction of maximum target lock-on range for a 1.06 micron laser target designator weapon system where atmospheric attenuation of the laser radiation is the limiting system factor is derived. The laser range equation is based on the assumption of specific designator/receiver design characteristics, the assumption that the target is a Lambert surface, and the assumption of the validity of the Beer-Lambert Law for describing atmospheric propagation of laser radiation. Author (GRA)

N74-30986# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
LASER DIAGNOSTIC TECHNIQUES AT POLYTECHNIC INSTITUTE OF NEW YORK AEROSPACE FACILITIES Interim Report
S. Lederman, M. H. Bloom, J. Bornstein, and P. K. Khosla May 1974 31 p refs
(Contract N00014-67-A-0226-0005; Contract DAHC04-69-C-0077)
(AD-780451; PINY-AE/AM-74-8) Avail: NTIS CSCL 06/2

A short discussion of some conventional diagnostic techniques, followed by a discussion of the Raman effect and the laser Doppler anemometer, is given. The apparatus used at PINY and the techniques developed utilizing the Raman effect

are described. Some experimental results concerning concentrations of mixtures and temperature measurements in flames are presented and discussed. Author (GRA)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-30987*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF PLASTIC DEFORMATION AND PHASE TRANSFORMATIONS AT NEGATIVE TEMPERATURES ON THE PROPERTIES OF TITANIUM ALLOYS
I. N. Bogachev, M. A. Dyakova, A. K. Bezrukova, and S. I. Selitskaya Washington NASA Aug. 1974 9 p refs Transl. into ENGLISH from the book "Vliyaniye Plasticheskoy Deformatsii i Fazovykh Prebrascheniy pri Otritsatelnykh Temperaturakh na Svoystva Splavov Titana" Moscow, Nauka Press, 1972 p 104-108
(Contract NASw-2481)
(NASA-TT-F-15477) Avail: NTIS HC $4.00 CSCL 11F

Decomposition of the Beta-solid solution occurs and deformation martensite is formed in titanium alloys with an unstable Beta-solid solution at negative temperatures from -40 deg to -120 deg. Preliminary plastic deformation by expansion (4%) at negative temperatures of alloys with an unstable Beta-solid solution reduces the intensity of deformation martensite and causes a smaller increase of strength properties than cold treatment. Small preliminary plastic deformation of an alloy with a more stable Beta-solid solution, on the base of an alpha-solid solution, causes a greater increase of strength properties than ordinary cold treatment. Author

N74-30988 British Library Lending Div., Boston Spa (England).
ORDERING OF A SOLID SOLUTION IN MOLYBDENUM PERMALLOYS
V. I. Gormankov, I. M. Puzei, E. I. Maltsev, and N. Ya. Frolov Feb. 1974 9 p refs Transl. into ENGLISH from Sb. Tr. Tsent. Nauch.-Issled. Inst. Chern. Met. (USSR), v. 78, 1971 p 176-180
(BLL-RTS-8782) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

An analysis of the ordering of the solid solution of molybdenum permalloy was conducted. The effect of molybdenum content on the superlattice of the alloy of stoichiometric composition of Ni3Fe was determined. The crystal structure of the molybdenum permalloy of a standard chemical composition was studied. Neutron diffraction structure techniques were used for conducting the analyses. The elastic scattering of thermal neutrons from polycrystalline specimens is tabulated. Author

N74-30989 British Library Lending Div., Boston Spa (England).
VACANCY PRODUCTION BY THERMAL JOGS DURING PLASTIC DEFORMATION
W. Witzel 27 Feb. 1974 9 p refs Transl. into ENGLISH from Z. Metallk. (Stuttgart), v. 64, no. 8, Aug. 1973 p 585-589
(BLL-Dounreay-TR-654-(9091.9F)) Avail. British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The production of vacancies by plastic deformation was analyzed by computing climb jumps in screw dislocations, and also the climb of edge dislocations. The methods were found to be inadequate which led to the presentation of a mechanism whereby vacancy formation through thermal jogs is applicable to the analysis at temperatures of 0.4 to 0.6 T sub s, where T sub s is the melting temperature. The development of the total diffusion coefficients of copper during plastic deformation with a strain rate of 0.01/s is described to demonstrate that diffusion results almost exclusively from thermal vacancies. A.A.D.

N74-30990 British Library Lending Div., Boston Spa (England).
SINTERED HARD MATERIALS BASED ON STEEL
F. Frehn [1974] 9 p refs Transl. into ENGLISH from VDI-Berichte, no. 194, 1973 p 109-112 In ENGLISH and GERMAN
(BLL-Risley-TR-2719-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Workable and hardenable steel alloys are discussed along with the structures of Cr tool steel and the temper of sintered hard metals. F.O.S.

N74-30991*# Lockheed Missiles and Space Co., Huntsville, Ala.
BEADING AND SPIKING PHENOMENA IN THE M551 METALS MELTING EXPERIMENT Addendum to Final Report
C. Fan and M. R. Brashears 1 May 1974 36 p refs
(Contract NAS8-28729)
(NASA-CR-120352; LMSC-HREC-TR-D-390181-Add) Avail: NTIS HC $5.00 CSCL 11F

A study was made regarding the beading and spiking phenomena observed in the M551 metals melting experiment conducted during the Skylab I mission in June 1973. An analysis was made of the beading phenomenon based on the Karman vortex shedding theory. The results tend to support the hypothesis that beading which occurred in the stainless and tantalum samples was a Karman vortex street formation. A dynamic model of cavity oscillation is discussed to explain the spiking phenomenon which was observed in the stainless steel and tantalum samples. Calculations of spiking frequency indicate that the intensity of spiking depends primarily on the vapor pressure and surface tension properties of the material, and is only slightly affected by the level of gravitation acceleration. Author

N74-30992# Erlangen-Nuremberg Univ. (West Germany).
THE DEVELOPMENT OF THE DISLOCATION STRUCTURE AND ITS EFFECT ON THE DEFORMATION BEHAVIOR IN ALUMINUM Ph.D. Thesis [DIE AUSBILDUNG DER VESETZUNGSSTRUKTUR UND DEREN BEZIEHUNGEN ZUM VERFORMUNGSVERHALTEN IN ALUMINIUM]
Frieder Schuh 1973 83 p refs In GERMAN
Avail: NTIS HC $7.25

The relationship between crystal deformation structure and forming behavior at room temperature is studied on aluminum by varying the degree of deformation, deformation- and annealing-temperatures, and alloy content changes. It is shown that density and cell structure markedly affect yield stress and residual stress during initial forming, and that the deformed structure recovers only through relaxation. Transl. by G.G.

N74-30993# Technische Hochschule, Hanover (West Germany).
STRUCTURAL CHANGES IN 50CrMo4 STEEL CAUSED BY THERMAL WORK HARDENING Ph.D. Thesis [EIGENSCHAFTSAENDERUNGEN DES STAHLS 50CrMo4 DURCH WARMFORMVERGUETEN]
Berend Snoeijer 1973 187 p refs In GERMAN
Avail: NTiS HC $12.50

Hardness, microstructure, extrusion and notch impact studies on 50CrMo4 steels after thermomechanical forming show that the degree of deformation does not affect the mechanical properties of the steels significantly. Accelerated recrystallization is only observed at higher degrees of deformation. Differing rest periods between forming and hardening control recrystallization; faster austenization improves tensile strength but lowers characteristic deformation parameters and notch impact resistance. Thermomechanical forming with a rest period of more than 400 s improves austenitic phase transformation, yield strenght, and micro-structure of the steels. Transl. by G.G.

N74-30994# Japan Atomic Energy Research Inst., Tokyo.
CREEP AND CREEP-RUPTURE TESTS OF DOMESTIC SUS 316 STAINLESS STEEL AS A STRUCTURAL MATERIAL OF THE FAST BREEDING REACTOR
S. Yokoi, Y. Monma, T. Fujimura, and T. Kodaira May 1973 35 p refs In JAPANESE; ENGLISH summary
(JAERI-M-5269) Avail: AEC Depository Libraries

Creep and creep-rupture tests were carried out on domestic SUB 316 stainless steel. Creep tests were made at 500, 550, and 600 C on specimens taken from heavy thickness plates (t=30mm), and creep-rupture tests on the specimens from several kinds of SUS 316 stainless steels and their weld metals

at 500 and 600 C. It was found that, in the creep tests of two different charges, the minimum creep rate was higher for one than the other at 500 and 550 C, but this tendency was reversed at 600 C. Adding nitrogen and niobium to plain 316 stainless steel as alloying elements is effective in increasing the creep-rupture strength. The rupture time of weld-metal specimens is about one order lower than the base metals at 600 C. for the same stress level. All materials tested exhibit good ductility in ruptures. Creep properties of all the materials meet the criteria of ASME Boiler and Pressure Vessel Code. Author (NSA)

N74-30995# Cologne Univ. (West Germany).
THE BRITTLE FRACTURE MECHANISM AND THE PHYSICAL CAUSES FOR THE DIFFERENTIAL GRADING OF STEELS BY THEIR TRANSITION TEMPERATURES Ph.D. Thesis [DER MECHANISMUS DES SPROEDBRUCHES UND DIE PHYSIKALISCHEN URSACHEN DER UNTERSCHIEDLICHEN EINSTUFUNG DER STAEHLE AND HAND IHRER UEBERGANGSTEMPERATUREN]
Walter Fink 1973 217 p refs In GERMAN
Avail: NTIS HC $14.00

Fracture dislocation theory is used to analyze the various mechanisms of crack initiation and crack propagation in steels and to develop the conditions that lead to brittle fracture. Qualitative studies on steel microstructures show that heat treatment and grain size determine the mechanical parameters of steels and affect their transformation temperatures.

Transl. by G.G.

N74-30996*# Kanner (Leo) Associates, Redwood City, Calif.
PHASE TRANSFORMATIONS DURING THERMAL TREATMENT OF ALLOY VT18
O. S. Korobov, K. M. Borzetsovskaya, Yu. M. Lebedev, N. M. Semenova, L. A. Yelagina, and F. L. Lokshin Washington Pub NASA Jul. 1974 8 p refs Transl. into ENGLISH from the book "Fazovyye Prevrashcheniya pri Termicheskoy Obrabotke Splava VT18" Moscow, Nauka Press, 1972 p 74-77
(Contract NASw-2481)
(NASA-TT-F-15470) Avail: NTIS HC $4.00 CSCL 11F

The VT18 alloy was investigated during heat treatment, and it was shown that at temperatures below 930 deg, the alpha sub 2-phase and some of the beta-phase are present, apart from the alpha-matrix. During aging, the changes are determined by the formation of the ordered alpha sub 2-phase. After longer exposure, the beta-phase decomposes. The instability of VT18, at working temperatures, is due to the ordering of the alpha-solid solution and decomposition of the beta-phase. Author

N74-30997*# Kanner (Leo) Associates, Redwood City, Calif.
STRUCTURAL TRANSFORMATIONS IN TWO-PHASE TITANIUM ALLOYS
E. V. Polyak, A. Yu. Sokolova, I. I. Kornilov, ed., and N. G. Boriskina, ed. Washington NASA Jul. 1974 8 p refs Transl. into ENGLISH from the book "Novyy Konstruktsionnyy Material: Titan" USSR, Nauka Press, 1972 p 66-70
(Contract NASw-2481)
(NASA-TT-F-15468) Avail: NTIS HC $4.00 CSCL 11F

Research was carried out into two-phase titanium alloys. VT22 and VT14 alloys were investigated. It was found in VT14 that many defects occur in crystal structure when the alloy is heated. Defects disappear when the alloy is heated further to an almost annealed state. The VT22 alloy becomes brittle during aging when quenched from 1000 C. Optimum thermal strengthening is achieved by quenching from the alpha + beta state, not higher than 700 C, with subsequent aging. Author

N74-30998*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF PLASTIC DEFORMATION AND ALLOYING WITH SMALL ADDITIONS OF OXYGEN ON THE DECOMPOSITION OF METASTABLE BETA-PHASE IN THE ALLOY TS6
P. M. Lerinman, G. V. Murzayev, M. A. Nikanorov, K. I. Khyostyntsev, I. I. Kornilov, ed., and N. G. Boriskina, ed. Washington NASA Aug. 1974 14 p refs Transl. into ENGLISH from the book "Novyy Konstruktsionnyy Material: Titan" Moscow, Nauka Press, 1972 p 81-88
(Contract NASw-2481)
(NASA-TT-F-15472) Avail: NTIS HC $4.00 CSCL 11F

An analysis of the effects of plastic deformation and the addition of oxygen on the decomposition of TS 6 alloy was conducted. It was determined that interstitial atoms accelerate the decomposition of the beta phase, create a more even structure after aging, and reduce the boundary layers from the undecomposed beta phase in the TS 6 alloy. With mechanical and thermal treatment, the effect of the increased content of impurities on the decomposition of the beta phase is less than during normal aging, since there is a predominance of alpha phase particles in dislocations, and not in vacancy clusters.

Author

N74-30999*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF TEMPERATURE ON THE PLASTICITY OF TITANIUM
L. S. Moroz, S. S. Ushkov, I. I. Kornilov, ed., and N. G. Boriskina, ed. Washington NASA Aug. 1974 9 p refs Transl. into ENGLISH from the book "Titan (A New Construction Material: Titanium)" Moscow, Nauka Press, 1972 p 89-93
(Contract NASw-2481)
(NASA-TT-F-15473) Avail: NTIS HC $4.25 CSCL 11F

Titanium was studied to show the effect of temperature on its plasticity. The reduction of the complete elongation at medium temperatures is not the result of brittleness, but the reduction of its plastic deformation corresponding to the decrease of deformation hardness during an increased temperature. Elongation of low-alloyed titanium alloys during reduced temperatures, even to negative temperatures, increases the same as for pure titanium. In this way, titanium and its alloys are suitable for cryogenic equipment. Author

N74-31000*# Kanner (Leo) Associates, Redwood City, Calif.
PROPERTIES OF ALLOY 4201 AT ELEVATED TEMPERATURES
A. T. Pronin, N. G. Boriskina, Ye. I. Oginskaya, S. V. Moroznikova, V. A. Yermishkin, I. I. Kornilov, ed., and N. G. Boriskina, ed. Washington NASA Aug. 1974 7 p refs Transl. into ENGLISH from the book "Novyy Konstruktsionnyy Material: Titan" Moscow, Nauka Press, 1972 p 93-97
(Contract NASw-2481)
(NASA-TT-F-15474) Avail: NTIS HC $4.00 CSCL 11F

Alloy 4201 was investigated at elevated temperatures using various types of equipment for testing its strength, elastic modulus, creep, etc. both in rod and sheet specimens. The impact strength is reduced at temperatures of 1000 deg and 1200 deg due to the increase of the grain caused by intensive recrystallization processes of the alloy. In view of this and other changes which occur, these features must be taken into account when using semi-finished products in assemblies and designating values of permissible stresses. Author

N74-31001*# Kanner (Leo) Associates, Redwood City, Calif.
MECHANISM OF THE INHIBITED FAILURE OF PLASTIC TITANIUM ALLOYS
V. N. Meshcheryakov, M. Kh. Shorshorov, I. I. Kornilov, ed., and N. G. Boriskina, ed. Washington NASA Aug. 1974 11 p refs Transl. into ENGLISH from the book "Novyy Konstruktsionnyy Material: Titan" Moscow, Nauka Press, 1972 p 97-100
(Contract NASw-2481)
(NASA-TT-F-15475) Avail: NTIS HC $4.00 CSCL 11F

The mechanism for the inhibited failure of plastic titanium alloys was investigated, and it was shown that Gilman and Rozhanskiy models should be used when research is done into cracks which form in metal with a hexagonal close packed lattice. The total deformation, when stable submicrocracks occur, when testing specimens for inhibited failure, in value, is less than when these specimens are tested for static expansion.

Author

N74-31002*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE EFFECT OF CERTAIN ELEMENTS ON THE HIGH-TEMPERATURE STRENGTH OF ALUMINUM-TITANIUM (Ti3Al)
O. N. Andreyev and I. I. Kornilov Washington NASA Aug. 1974 7 p refs Transl. into ENGLISH from the book "Isslena Zharoprochnost Alyuminida Titana Ti3Al" Moscow, Nauka Press, 1972 p 101-104 sap
(Contract NASw-2481)
(NASA-TT-F-15476) Avail: NTIS HC $4.00 CSCL 11F

Elements from groups 4, 8, and 4B were used to examine the heat resistance of aluminum-titanium, when alloyed with them. It was found that when alloyed with vanadium or molybdenum, Ti3Al is more easily deformed at high temperatures. The great heat resistance of the alloy at 750 deg and a stress of 25 kgf/sq. mm occurs when alloyed with 1 technical atmosphere% of W, Sn, Mo, Hf, Si, Zr, Tr, Nb, V. Author

N74-31003*# Kanner (Leo) Associates, Redwood City, Calif.
CHARACTERISTICS OF THE EFFECT OF ALUMINUM ON THE MECHANICAL PROPERTIES OF TITANIUM
L. S. Moroz, I. N. Razuvayeva, and S. S. Ushkov Washington NASA Aug. 1974 11 p refs Transl. into ENGLISH from the book "Novyy Konstruktsionnyy Material: Titan" Moscow, Nauka Press, 1972 p 109-114
(Contract NASw-2481)
(NASA-TT-F-15478) Avail: NTIS HC $4.00 CSCL 11F

Changes in ultimate strength, relative elongation, and relative reduction of the Ti-Al system are investigated for alloys of different aluminum content. Aluminum is distributed unevenly in the structure, due to its solution in the alpha-phase. The changes in the mechanical properties of titanium occur, apparently, not only because of elastic distortions, introduced into the titanium lattice by aluminum atoms, but also due to the appearance of a second phase. The inhomogeneity of aluminum causes it to concentrate in separate microvolumes, and this is sufficient for a second phase to occur, although this alpha 2-phase only occurs with an aluminum content of 7.5%. Author

N74-31004*# United Aircraft Corp., East Hartford, Conn. Research Labs.
PROCESSING EUTECTICS IN SPACE Final Report, 8 Jun. 1973 - 8 Jul. 1974
Frank C. Douglas and Francis S. Galasso 8 Jul. 1974 58 p refs
(Contract NAS8-29669)
(NASA-CR-120391; N911721-12) Avail: NTIS HC $6.00 CSCL 11F

Studies which have been done in an earth-based laboratory environment have generally not yielded specimens with the degree of perfection required of the eutectic microstructure to provide test data to evaluate their nonstructural applications. It has been recognized that the low-g environment of an orbiting space laboratory provides a unique environment to re-examine the process of solidification with the goal of producing better microstructures. The objective of this program is to evaluate the feasibility of using the space environment for producing eutectics with microstructures which can be of value on earth. In carrying out this objective, evaluative investigations were carried out on the technology of solidification in a 1-g environment to provide sound baseline data for planning space laboratory experiments. Author

N74-31005*# Rice Univ., Houston, Tex.
STRESS CORROSION IN TITANIUM ALLOYS AND OTHER METALLIC MATERIALS Final Report, 1 Jun. 1968 - 30 Sep. 1971
C. G. Harkins, ed., F. R. Brotzen, J. W. Hightower, R. B. McLellan, J. M. Roberts, M. L. Rudee, I. R. Leith, P. K. Basu, K. Salama, D. P. Parris et al 30 Sep. 1971 133 p refs
(Grants NGR-44-006-088; NGL-44-006-033)
(NASA-CR-139562) Avail: NTIS HC $9.75

Multiple physical and chemical techniques including mass spectroscopy, atomic absorption spectroscopy, gas chromatography, electron microscopy, optical microscopy, Electronic Spectroscopy for Chemical Analysis (ESCA), infrared spectroscopy, Nuclear Magnetic Resonance (NMR), X-ray analysis, conductivity, and isotopic labeling were used in investigating the atomic interactions between organic environments and titanium and titanium oxide surfaces. Key anhydrous environments studied included alcohols, which contain hydrogen; carbon tetrachloride, which does not contain hydrogen; and mixtures of alcohols and halocarbons. Effects of dissolved salts in alcohols were also studied. This program emphasized experiments designed to delineate the conditions necessary rather than sufficient for initiation processes and for propagation processes in Ti SCC. Author

N74-31006*# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
TDNiCr (Ni-20Cr-2ThO2) FORGING STUDIES Final Report
A. M. Filippi Feb. 1974 157 p refs
(Contract NAS3-15548)
(NASA-CR-134619; WANL-M-FR-74-001) Avail: NTIS HC $11.00 CSCL 11F

Elevated temperature tensile and stress rupture properties were evaluated for forged TDNiCr (Ni-20Cr-2ThO2) and related to thermomechanical history and microstructure. Forging temperature and final annealed condition had pronounced influences on grain size which, in turn, was related to high temperature strength. Tensile strength improved by a factor of 8 as grain size changed from 1 to 150 microns. Stress-rupture strength was improved by a factor of 3 to 5 by a grain size increase from 10 to 1000 microns. Some contributions to the elevated temperature strength of very large grain material may also occur from the development of a strong texture and a preponderance of small twins. Other conditions promoting the improvement of high temperature strength were: an increase of total reduction, forging which continued the metal deformation inherent in the starting material, a low forging speed, and prior deformation by extrusion. The mechanical properties of optimally forged TDNiCr compared favorably to those of high strength sheet developed for space shuttle application. Author

N74-31007# Sandia Corp., Albuquerque, N.Mex.
DEVELOPMENT OF A HIGH STRAIN RATE CONSTITUTIVE EQUATION FOR 6061-T6 ALUMINUM
W. Herrmann Nov. 1973 47 p refs
(Contract AT(29-1)-789)
(SLA-73-897) Avail: NTIS HC $4.50

A relatively simple viscoplastic constitutive equation is constructed from previously published experimental data for 6061-T6 aluminum. Equilibrium strain-hardening behavior is described by a multi-element model, which includes a Bauschinger effect, fitted to static uniaxial stress data. Elastic moduli and their dependence on strain and internal energy are determined by a Mie-Grueneisen equation of state evaluated from ultrasonic data and high-pressure shock-wave data. The relaxation function is evaluated from compressive steady-wave data. The constitutive equation is used to obtain numerical flow field solutions of plate impact experiments which are compared with existing experimental unloading wave data. Author (NSA)

N74-31008# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
RELAXATION STRENGTH OF THE SNOEK EFFECTS OF HYDROGEN IN VANADIUM, NIOBIUM, AND TANTALUM
J. Buchholz Jun. 1973 111 p refs In GERMAN
(JUL-962-FF) Avail: AEC Depository Libraries HC $7.75

A new method was used based on measuring elastic constants as a function of the temperature in the temperature region above the damping maximum of torsional oscillations. The Snoek relaxation should be noticeable in the region in a change of the absolute value and as a result of the 1/T dependence on the relaxation intensity, and also as change of the temperature dependence. The torsion modulus of hydrogen-charged monocrystalline samples of Ta, Nb, and V in the (111) and (100) directions was carried out in a temperature range from room temperature to 150 C. The observed change of the absolute value of the modulus as a function of the hydrogen concentration was to three orders of magnitude smaller than expected by comparison with N, O, and C. No paraelastic part with a 1/T temperature dependence could be seen. NSA

N74-31009# National Academy of Sciences - National Research Council, Washington, D.C.
NEUTRON ACTIVATION TECHNIQUES FOR THE MEASUREMENT OF TRACE METALS IN ENVIRONMENTAL SAMPLES
D. E. Robertson and R. Carpenter Jan. 1974 94 p refs
(NAS-NS-3114) Avail: NTIS HC $3.00

Neutron activation techniques for measuring trace metals in fresh waters, seawater, marine organisms, sediments, and atmospheric particulates are discussed. Principles of neutron activation analysis, neutron irradiation facilities and procedures, and sample preparation including preconcentration and postirradiation separations are outlined. NSA

N74-31010# Dow Chemical Co., Golden, Colo. Rocky Flats Div.

CORROSION AND STRESS-CORROSION CRACKING OF WELDED URANIUM-6 WEIGHT PERCENT NIOBIUM

J. M. Macki and R. L. Kochen 27 Dec. 1973 17 p refs

(Contract AT(29-1)-1106)

(RFP-2033) Avail: NTIS HC $4.00

The resistance of corrosion and stress-corrosion cracking of welded U-6 wt % Nb in oxygen-saturated water containing 50 ppM chloride ions was investigated. The tests showed that a post-weld heat treatment consisting of solution quenching and underaging (350 C for 42 min) provided the best resistance to corrosion and pitting corrosion. Although selective corrosion and pitting corrosion were observed on many of the specimens tested, no evidence of stress-corrosion cracking was found.

Author (NSA)

N74-31011# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.

INVESTIGATIONS ON THE REACTION BEHAVIOR OF AUSTENITIC STEELS WITH SIMULATED FISSION PRODUCTS IN THE PRESENCE OF UC

P. Hofmann Oct. 1973 62 p refs In GERMAN

(KFK-1832) Avail: AEC Depository Libraries HC $5.25

One of the problems in operation of a fast breeder reactor is the cladding attack by the fuel when using oxide pins. Fission products are involved in all chemical reactions between fuel and cladding that give rise to damage. The situation is somewhat different when carbide pins are used. Fission product elements were mixed to stoichiometric and over-stoichiometric UC both as single elements and in groups in amounts corresponding to 10 and 20 at.% burnup. These mixtures were annealed in contact with various cladding materials. It was found that no specific fission product reactions with the cladding are to be expected in carbide pins. Among those fission product elements that prove to be reactive with the cladding material when mixed to oxide fuel, i.e., cesium, iodine, tellurium, and selenium, only iodine reacts with the cladding materials in the presence of carbide fuel.

NSA

N74-31012# Japan Atomic Energy Research Inst., Tokyo.

PERFORMANCE TESTS OF A542 CLASS 1 HEAVY SECTION STEEL AND ITS WELD FOR NUCLEAR VESSELS

T. Fujimura, T. Kodaira, H. Susukida, and T. Ando Jun. 1973 40 p In JAPANESE

(JAERI-M-5297) Avail: AEC Depository Libraries

With increase in size of a nuclear pressure vessel, integrity of the vessel materials assumes special importance. In the high-temperature gas cooled experimental reactor, being planned in the JAERI, the design temperatures of pressure components are 450 to 500 C, about 100 C higher than those in light-water cooled reactors. Under these conditions, ASTM A542 class steel is the best selection, considering fabrication of the vessel. This material, however, has been used little in the nuclear industry, but has had extensive use in the chemical industry. The results of performance tests on manufacture of the materials, welding performance, and mechanical and metallurgical characteristics are described.

Author (NSA)

N74-31013# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.

FAILURE ANALYSIS OF MICROFLAWED DUCTILE MATRIX MATERIALS

Ronald E. Frishmuth Apr. 1974 117 p refs

(Grants DAHC15-72-G-10; DAHC15-73-G-7; ARPA Order 2169)

(AD-780191; T/AM-384; UILU-ENG-74-6006) Avail: NTIS CSCL 11/6

It is shown in this study that linear elastic fracture mechanics techniques do not provide a consistent geometry-independent means of predicting failure in microflawed ductile matrix materials. Several aspects of microflawed material behavior during fracture testing suggest that considerable plastic behavior occurs on the microscale in microflawed materials. It is suggested that limit analysis techniques applied first on the microscale than extended to the macroscale may provide a consistent means of failure prediction. Three-dimensional limit surfaces are developed for several types of microflawed materials. Comparison of these limit criteria with currently available theories and experimental data on microflawed materials in the absence of macroscale notches shows that the proposed theory is valid for smooth material failure predictions. In the current study, several geometries of fracture toughness specimens were used. The material used was ASTM Class 60 pearlitic matrix gray cast iron with type A-1 graphite. (Modified author abstract) GRA

N74-31014# Southwest Research Inst., San Antonio, Tex. Dept. of Instrumentation Research.

NONDESTRUCTIVE EVALUATION OF METAL FATIGUE Interim Scientific Report, Mar. 1973 - Jan. 1974

J. R. Barton, F. N. Kusenberger, P. H. Francis, W. L. Ko, and J. Lankford, Jr. Feb. 1974 61 p refs

(Contract F44620-70-C-0034; AF Proj. 9782; SwRi Proj. 15-2800)

(AD-780092; AFOSR-74-0820TR) Avail: NTIS CSCL 11/6

The role of those nondestructive evaluation (NDE) methods that can provide quantitative information about fatigue cracks to aid in the fracture mechanics determination of crack state is discussed. The qualitative characteristics of magnetic perturbation signatures from fatigue cracks in 4340 steel specimens which provide the basis for recent investigations are summarized. The results of the recent experiments involving the effects of post-crack heat treatments and probe orientations on crack signature characteristics are presented and discussed. While the significant signature characteristics do not appear to relate directly to certain physical features of fatigue cracks of interest, there is evidence that the magnetic signatures can provide quantitative information about the state of a fatigue crack. Limited investigations of approaches to improve the detection of fatigue cracks in Ti-6Al-4V alloy using ultrasonic surface wave and electric current injection methods are described and the results summarized. Metallurgical sectioning efforts were continued in the vicinity of inclusions with fatigue cracks in the early stages of development and the results support a model for the early stages of fatigue crack development which can explain the occurrence of nonpropagating cracks.

Author (GRA)

N74-31015# Waterloo Univ. (Ontario). Dept. of Civil Engineering.

CYCLIC INELASTIC DEFORMATION AND FATIGUE LIFE BEHAVIOR OF NOTCHED COMPONENTS

B. N. Leis, T. H. Topper, and C. V. B. Gowda Apr. 1974 41 p refs

(Grant AF-AFOSR-2120-71; AF Proj. 9782)

(AD-780120; AFOSR-74-0869TR) Avail: NTIS CSCL 11/6

Cyclic inelastic deformation response and fatigue notch factor are presented and discussed for two metals of contrasting stress-strain behaviour (an aluminum alloy 2024-T351 and a mild steel SAE 1015). Thin circular or elliptical notched plates fabricated from these metals were subjected to cyclic straining in a servo-controlled testing machine. Results of these tests are discussed in terms of cyclic stress and strain concentration factors and related to notch plate deformation through a parameter derived fron Neuber's rule. The results indicate that the deformation analysis employed, rather than a material size effect is responsible for values of K sub f less that K sub t.

Author (GRA)

N74-31016# British Steel Corp., Sheffield (England).

THE THERMAL ANALYSIS OF NITRIDE PHASES IN STEEL

G. White and G. Bradshaw Feb. 1974 20 p refs

(PB-230235/4; CAPL/SM/G/68/73) Avail: NTIS HC $4.00 CSCL 11F

The thermal decomposition characteristics of residues containing nitride phases have been studied using a system based upon the principle of simultaneous differential thermal analysis and effluent gas analysis. The characteristic oxidation temperatures of various nitrides isolated from ternary alloys of the type Fe-M-N, where M is a nitride forming element, were determined. Tests also showed that the identification of certain nitride phases present in mixtures of nitrides was feasible. Preliminary studies on residues isolated from quaternary alloys of the type Fe-M-N-C revealed problems which were attributed to the presence of carbon in the residues and further work is required before the technique can be extended to the examination of commercial steels. GRA

N74-31017# Bureau of Mines, Washington, D.C.
INFLUENCE OF MANGANESE ADDITIONS UPON PROPERTIES OF IRON ORE PELLETS
R. B. Schluter and B. W. Carriere Jan. 1974 23 p refs
(PB-228627/6; BM-I-7870) Avail: NTIS HC $3.00 CSCL 11F

Because most iron ore produced in the United States is marketed as low-manganese pellets, this investigation was carried out to determine the effects of adding manganese in several forms to iron ore pellets during the balling process. The pellets, prepared with manganese contents of from 1 to 5%, were evaluated and compared to standard pellets, for compression strength, reducibility and microstructure. GRA

N74-31018# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
INTERRUPTED JET WATER GUN IMPACT-EROSION STUDIES ON METALLIC ALLOYS
F. G. Hammitt, J. B. Hwang, and Linh N. Do Oct. 1973 29 p refs
(Grant NSF GK-1889)
(PB-227581/6; Rept-01357-32-T) Avail: NTIS $4.50 CSCL 11F

Erosion test results are reported for water impact tests using an interrupted water jet for perpendicular and angled impact over the velocity range 400 to 600 m/s, using primarily aluminum 1100-0 and F, and nickel 270 as test materials. These materials were previously used in related tests for a Round Robin test program. Photographs indicating the development of the damage patterns as a function of impact angle are included. It is found for this particular device that maximum damage rate and minimum incubation period are obtained for an intermediate velocity. The existence of this maximum in the damage vs. velocity curve is a result of the change in shape of the jet leading edge as velocity is varied. It is also found that damage at fixed velocity decreases strongly as the impingement angle is reduced from perpendicular impact. GRA

N74-31019# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
LOW CYCLE FATIGUE BEHAVIOR AND CRACK PROPAGATION IN SOME STEELS
Saurindranath Majumdar Apr. 1974 29 p refs
(Contract DAHC15-72-G-10)
(AD-780180; T/AM-387; UILU-ENG-74-6009) Avail: NTIS CSCL 11/6

In a previous report, a fatigue crack propagation model was analyzed by considering fatigue crack propagation as a sequence of fatigue crack initiation events. This permitted correlation to be made between the fatigue crack growth resistance and low cycle fatigue properties of metals. Four steels were tested for low cycle fatigue behavior at the University of Illinois. Good correlation was obtained between the theoretically predicted crack propagation rate based on the measured low cycle fatigue properties of the four metals and experimentally observed crack propagation rates that were reported in the literature. Further, good estimates of crack propagation rates can be obtained on the basis of static tensile properties of the metals alone where cyclic properties are not available. Author (GRA)

N74-30927* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECTS OF HIGH-TEMPERATURE BRAZING AND THERMAL CYCLING ON THE MECHANICAL PROPERTIES OF HASTELLOY X
Dennis L. Dicus and John D. Buckley *In its* Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 23 p refs
(For availability see N74-30922 20-15)
CSCL 11F

N74-30930* Northrop Corp., Hawthorne, Calif. Materials Research Lab.
THIN-FILM DIFFUSION BRAZING OF TITANIUM ALLOYS
E. B. Mikus *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 33 p
(For availability see N74-30922 20-15)
CSCL 11F

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-31020 British Library Lending Div., Boston Spa (England).
THE INFLUENCE OF CRYSTAL SIZE ON THE CREEP OF Al2O3 CERAMICS
N. T. Andriano et al Feb. 1974 6 p refs Transl. into ENGLISH from Tr. Mosk. Khim.-Tekhnol. Inst. (USSR), v. 68, 1971 p 106-108
(BLL-RTS-8849) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The creep properties of ceramics made from aluminum oxide with different grain size were investigated. The preparation and characteristics of the aluminum oxide samples are discussed. The test equipment and the test methods are described. The data show that the rate of creep decreases with an increase in crystal size of the aluminum oxide while the nature of the variation of rate of creep with stress does not change. The effects of embrittlement of the ceramic material in the aging process are also considered. Author

N74-31021 British Library Lending Div., Boston Spa (England).
APPLICATION OF THE DEW CYCLE WEATHEROMETER TO THE DEGRADATION OF PLASTICS
Naomichi Bussho [1973] 6 p refs Transl. into ENGLISH from Purasuchikkusu (Japan), v. 23, no. 52 p 54-58
(BLL-Kirkby-Trans-68-(9022.49)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of a dew cycle weatherometer for testing the weathering characteristics of plastic building materials is discussed. The construction and operation of the test equipment are discussed. It was determined that the dew cycle weatherometer provides a means of evaluating the degradation of plastics with a decrease in the time required. The results of tests conducted on various types of plastics are reported. Author

N74-31022 British Library Lending Div., Boston Spa (England).
EFFECTS OF TEMPERATURE GRADIENT ON dc BREAKDOWN STRENGTH OF CROSS-LINKED POLYETHYLENE INSULATION
M. Nakagawa et al Jan. 1974 18 p refs Transl. into ENGLISH from Dainichi-Nihon Densen Jiho (Japan), v. 52, 1972 p 26-31
(BLL-RTS-8513) Avail: British Library Lending Div., Boston Spa, Engl.: £ 1.70 or 6 BLL photocopy coupons

Tests were conducted to determine the effects of temperature gradient on the direct current breakdown strength of cross-linked polyethylene insulation. Tests were conducted with 0.9 millimeter thick specimens and the following results were obtained: (1) the d.c. breakdown strength decreases with increasing temperature, and (2) the breakdown strength of the insulation with temperature gradient is approximately 10 percent lower than the values of uniform temperature distribution. It was concluded that the field distribution is different from that of uniform temperature conditions and that temperature gradient produces distortion of the electric field. The temperature dependency characteristics of conduction current were also measured with the same specimens. The current density versus average field strength relations showed strong nonlinearities, without the influences of temperature gradient, which suggest generation of space charges. Author

N74-31023*# Grambling State Univ., La. Dept. of Physics.
NUCLEAR QUADRUPOLE RESONANCE STUDIES IN SEMI-METALLIC STRUCTURES Semiannual Status Report
A. Narasimha Murty 15 Aug. 1974 32 p refs
(Grant NGR-19-011-016)
(NASA-CR-138306; SASR-3) Avail: NTIS HC $4.75 CSCL 11D

Both experimental and theoretical studies are presented on spectrum analysis of nuclear quadrupole resonance of antimony

and arsenic tellurides. Numerical solutions for secular equations of the quadrupole interaction energy are also discussed. J.A.M.

N74-31024*# Ceramic Finishing Co., State College, Pa.
IMPROVING IMPACT RESISTANCE OF CERAMIC MATERIALS BY ENERGY ABSORBING SURFACE LAYERS
H. P. Kirchner and J. Seretsky Mar. 1974 56 p refs
(Contract NAS3-17765)
(NASA-CR-134644) Avail: NTIS HC $6.00 CSCL 11D

Energy absorbing surface layers were used to improve the impact resistance of silicon nitride and silicon carbide ceramics. Low elastic modulus materials were used. In some cases, the low elastic modulus was achieved using materials that form localized microcracks as a result of thermal expansion anisotropy, thermal expansion differences between phases, or phase transformations. In other cases, semi-vitreous or vitreous materials were used. Substantial improvements in impact resistance were observed at room and elevated temperatures. Author

N74-31025*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPRESSIVE STRENGTH OF FIBER REINFORCED COMPOSITE MATERIALS
John G. Davis, Jr. Aug. 1974 22 p refs Presented at ASTM: Composite Reliability Conf., Las Vegas, Nev., 15-16 Apr. 1974
(NASA-TM-X-71992) Avail: NTIS HC $3.00 CSCL 11D

Results of an experimental and analytical investigation of the compressive strength of unidirectional boron-epoxy composite material are presented. Observation of fiber coordinates in a boron-epoxy composite indicates that the fibers contain initial curvature. Combined axial compression and torsion tests were conducted on boron-epoxy tubes, and it was shown that the shear modulus is a function of axial compressive stress. An analytical model which includes initial curvature in the fibers and permits an estimate of the effect of curvature on compressive strength is proposed. Two modes of failure which may result from the application of axial compressive stress are analyzed, delamination and shear instability. Based on tests and analysis, failure of boron-epoxy under axial compressive load is due to shear instability. Author

N74-31026*# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
WASTE LUBRICATING OIL RESEARCH: SOME INNOVATIVE APPROACHES TO RECLAIMING USED CRANK-CASE OIL
M. L. Whisman, J. W. Goetzinger, and F. O. Cotton 1974 23 p refs
(BM-RI-7925) Avail: NTIS HC $4.25

The processes tested for reclaiming used lubricating oil including percolation through both chemically treated clay and ion-exchange resins, distillation through batch and continuous wiped-wall vacuum apparatus, treatment with solvent extraction systems, and chemical removal of impurities with chelating agents. The criteria of evaluation for each treatment was oil recovery and reduction of acidic and metallic components. Both vacuum distillation and solvent treatment ranked high in their abilities to remove acidic and metallic components of the used oil with good oil recoveries. A combination of the two techniques gave the best overall results in terms of quality evaluations made by established bench tests. Author

N74-31027*# Hanford Engineering Development Lab., Richland, Wash.
ELECTRICAL, MECHANICAL, AND RADIATION RESISTANT PROPERTIES OF CERAMICS AND CERAMIC-TO-METAL END SEALS FOR IN-VESSEL FFTF OR LMFBR INSTRUMENTATION CABLES
L. D. Muhlestein and L. D. Philipp Nov. 1973 33 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-73-88) Avail: NTIS HC $4.00

The study focused on Al2O3 with major attention devoted to the specific problem area of the ceramic-to-metal end seals for use with instrumentation cables. Ceramic mixtures of alumina, as the major constituent, with silica, calcia and magnesia were considered with variations in the alumina concentration and grain size as parameters. Stronger ceramic-to-metal bond strengths can be achieved using lower Al2O3 concentrations (approximately 94%) and larger grain size (approximately 30 microns), while adverse radiation effects are minimized with higher concentrations (approximately 99%) and smaller grain sizes (approximately 3 to 5 microns). The electrical properties of ceramic-to-metal seals are best for a single material of high purity, high density, unglazed Al2O3. Parameters which normally produce good bonding can result in decreased resistance to radiation damage and poor electrical properties; thus, parametric compromises or other modifications are being established to insure acceptable bond strength, electrical properties, and radiation resistance. Author (NSA)

N74-31028# Technion - Israel Inst. of Tech., Haifa. Dept. of Materials Engineering.
DETERMINING THE LOAD-TIME HISTORY OF FIBER COMPOSITE MATERIALS BY ACOUSTIC EMISSION
A. Rotem and J. Baruch Mar. 1974 27 p refs
(Grant AF-AFOSR-2607-74)
(AD-780122; MED-44; AFOSR-74-0871TR; SR-2) Avail: NTIS CSCL 11/4

Acoustic emission was monitored during the axial loading of unidirectional fiber composite tensile specimens. The material consisted of strong, brittle fibers (E glass) imbedded in a viscoelastic matrix (epoxy). It was found that when the load was held constant the acoustic emission output continued, but at a decreasing rate with time at load. As the load level was increased, the acoustic emission output at load continued for a longer period. It is suggested that the acoustic emission under constant load is a result of fiber fracture which continues after loading ceases because of the viscoelastic nature of the matrix which allows stress redistribution with time. The experimental results from acoustic emission are compared with computer calculations for fiber fracture based on theoretical considerations. Good agreement is noted between the theoretical and experimental results. Author (GRA)

N74-31029# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.
ATTENUATION AND DISPERSION CHARACTERISTICS OF VARIOUS PLASTICS IN THE FREQUENCY RANGE 1-10 MHz Interim Technical Report
M. P. Felix Mar. 1974 26 p refs
(Grant AF-AFOSR-1957-70; AF Proj. 6813; AF Proj. 9782)
(AD-780110; TR-16; AFOSR-74-0883TR) Avail: NTIS CSCL 11/9

It is observed experimentally that PMMA (polymethyl methacrylate) phenolic and various polyester resins exhibit little dispersion but significant frequency-dependent attenuation for dilatational waves in the frequency range 1 - 10 MHz. It is also shown that the shape of a low amplitude stress pulse propagating through a material with the above characteristics becomes significantly altered after propagating only a few cm. Thus the stress pulse distortion observed in plastic matrix-type composite materials may not be attributed to geometrical dispersion and attenuation alone; material attenuation in the matrix must be considered. The representation of these plastics by a standard linear viscoelastic solid is shown to provide an adequate model of the experimental data for the stated frequency range. Author (GRA)

N74-31030# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
FATIGUE CRACK INITIATION IN A BORON EPOXY PLATE WITH A CIRCULAR HOLE Interim Report
Larry A. Marcus, Wayne W. Stinchcomb, and Haldun M. Turgay Feb. 1974 68 p refs
(Contract AF-AFOSR-2358-72; AF Proj. 6813; AF Proj. 9781)
(AD-780106; VPI-E-74-6; AFOSR-74-0833TR) Avail: NTIS CSCL 11/4

Numerical results for the stress state around a circular hole in a (0/ plus or minus 45/0)s boron-epoxy plate under tensile loading are presented. This serves as a model for the initial stress state around the hole during fatigue loading. Comparison is drawn with experimental results for a fatigued specimen obtained from thermography and radiography. Using these results an interpretation of the effects of the initial stress state on the thermal behavior and on failure initiation is given. This

interpretation shows that the circumferential normal stresses are responsible for heat generation, and failure initiation is influenced by the interlaminar shear stresses in the outer 0 degree and -45 degree layers. GRA

N74-31031# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
MECHANICS OF FAILURE OF COMPOSITES Final Summary Report, 1 Apr. 1973 - 31 May 1974
Longin B. Greszczuk May 1974 129 p refs
(Contract N00019-73-C-0405)
(AD-780233; MDC-G5365) Avail: NTIS CSCL 11/4

Experimental and theoretical studies are presented on the influence of composite microstructure on the transverse tensile and shear strength of graphite and glass fiber-reinforced composites predicted from the previously formulated failure criteria. Sensitivity of the transverse and shear strength to variations and errors in fiber content, void content, resin content, specific gravity of composite, and properties of the fibers and the matrix is investigated. Results of the sensitivity studies are employed to predict the scatter in transverse and shear strength data as influenced by variables noted above. The predicted scatter in test data is shown to correlate well with actual scatter. The validity, importance, and effect of assumptions made in failure theory formulations are also investigated including the influence of fiber array, void shape, inelastic matrix effects, residual thermal stresses, and fiber-matrix interface. An approximate solution is presented for the residual thermal stresses in composites consisting of orthotropic fibers and isotropic matrix. Studies are also presented on compressive strength and failure modes of unidirectional composites. (Modified author abstract) GRA

N74-31032# Office of Naval Research, London (England).
CONFERENCE ON NEW AND IMPROVED RESIN SYSTEMS
Irvin Wolock 21 Dec. 1973 14 p refs Conf. held in London, 18-19 Sep. 1973
(AD-780485; ONRL-C-24-73) Avail: NTIS CSCL 11/9

The Reinforced Plastics Group of the Plastics Institute sponsored a two-day conference on New and Improved Resin Systems in London on 18-19 September, 1973. The purpose of the meeting was to discuss recent developments in resins and resin technology and how these are being and might be applied in practice. Among the resins discussed were fluorinated epoxies, vinyl esters, furanes, polyimides, Friedel-Crafts resins, rubber reinforced resins, and fire retardant resins. In addition, developments in silane coupling agents were discussed, and one paper was presented on studies of the effect of water on carbon fiber-epoxy composites. This report reviews some of the papers given. Author (GRA)

N74-31033# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
ULTIMATE STRENGTH ANALYSIS OF SYMMETRIC LAMINATES
R. S. Sandhu Feb. 1974 87 p refs
(AF Proj. 4364)
(AD-779927; AFFDL-TR-73-137) Avail: NTIS CSCL 11/4

A technique is presented for predicting the response of failure of composite laminates. In this technique, cubic spline interpolation functions are used to represent basic stress-strain curves obtained from simple tests. This representation in conjunction with an incremental constitutive law is used to generate response of laminates subjected to incremental loads. The ultimate load-carrying capacity of the laminates is determined by the plywise application of a new failure criterion using strain energy under longitudinal, transverse, and shear loadings as independent parameters. Results obtained by this technique are compared with the available experimental data of boron-epoxy laminates as well as the responses generated by methods of Petit-Waddoups and Hahn. Analytical results determined by the present theory correlate with the experimental data better than those obtained by the other two techniques. Author (GRA)

N74-31034# Monsanto Research Corp., St. Louis, Mo.
MOLDING OF ORIENTED SHORT FIBER COMPOSITES. 3: RATE EFFECTS ON FIBER ALIGNMENT IN CONVERGENT CHANNELS
L. A. Goettler May 1974 68 p refs
(Contract N00014-67-C-0218)
(AD-779907; HPC-72-150) Avail: NTIS CSCL 11/4

In an extension of the experiments performed on the compacted flow of a glass fiber-filled epoxy resin through a conical converging channel under a high pressure, the study examines the orientability of the fibers as the suspension flows into an empty mold cavity. The tensile properties of molded rods of 1/4 in. to 1/2 in. diameter reflect the level of orientation produced. Both the fiber orientability and the resulting orientation distribution depend strongly on the rate of elongation. The molded-in orientation distribution is also determined by the extent of convergence. Convergence angle, viscosity, and fiber length are secondary variables. The results indicate that fibers can be oriented to within 20 degrees of the flow axis by this technique in order to maximize elongation is thought to result from the high voidage in the material during flow. Author (GRA)

N74-31035# United Aircraft Corp., East Hartford, Conn. Research Labs.
DEVELOPMENT OF FIBER REINFORCED CERAMIC MATRIX COMPOSITES Final Report, Mar. 1973 - Mar. 1974
John J. Brennan Apr. 1974 58 p
(Contract n62269-73-C-0268)
(AD-778651; UARL-N911647-4) Avail: NTIS CSCL 11/4

Tantalum wire reinforced Si3N4 has been found to increase the Charpy impact strength of Si3N4 by a factor of over 30 (0.5 ft-lbs to 16 ft-lbs) at temperatures from RT to 1300C. The mode of failure is also affected such that interfacial splitting along with ductile wire elongation occurs, resulting in very small fragments of matrix breaking off upon impact. This mode of fracture is desirable for use in gas turbine engines. The Ta-Si3N4 composite system has also been found to exhibit a threshold energy below which no damage occurs upon either Charpy or ballistic impact that is considerably higher than unreinforced Si3N4. This effect is prevalent at both RT and elevated temperatures (1300C). In addition, thermal fatigue of Ta-Si3N4 composites between 200C and 1300C for up to 100 cycles and thermal aging at 1300C for up to 1000 hrs does not significantly lower impact properties nor does it affect the mechanisms of failure of the composite. (Modified author abstract) GRA

N74-30936* Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN OF BONDED JOINTS IN COMPOSITE MATERIALS
N. Corvelli *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 4 p refs
(For availability see N74-30922 20-15)
CSCL 11D

N74-30951* General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
SPECIAL NONDESTRUCTIVE TECHNIQUES FOR EVALUATING SPACE SHUTTLE SURFACE INSULATION
R. C. Stinebring *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 12 p
(For availability see N74-30922 20-15)
CSCL 11D

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-31036# Ruhr Univ., Bochum (West Germany).
COMBINATION OF SINGLE STEP- AND RELAXATION-METHOD Ph.D. Thesis [KOMBINATION VON EINZELSCHRITT- UND RELAXATIONSVERFAHREN]
Juergen Schade 1973 48 p refs In GERMAN
Avail: NTIS HC $5.50

An iterative procedure for solving systems of linear inhomogeneous algebraic equations is reported that combines whole

step relaxation with successive overrelaxation for optimal convergence of the iteration matrix. Transl. by G.G.

N74-31037# Technische Hochschule, Hanover (West Germany).
A CONTRIBUTION TO THE THEORY OF OPTIMAL CONTROL SYSTEM STRUCTURES, PROPERTIES AND SYNTHESES IN THE FREQUENCY REGION Ph.D. Thesis [EIN BEITRAG ZUR THEORIE DES STRUKTUROPTIMALEN REGELUNGSSYSTEMS, EIGENSCHAFTEN UND SYNTHESE IM FREQUENZBEREICH]
Klaus Heym 1972 97 p refs In GERMAN
Avail: NTIS HC $8.00

A synthesis algorithm is developed for solving an optimal control structure that has a quadratic value function. An analytical correlation between the cost matrix and the transfer matrix of the optimized system is used to determine pole- and zero-position distributions in matrix elements. The basic relationship for the transfer matrix of the optimization system is considered and some properties of the optimal structure system with indefinite evaluation are studied on a linear, time invariant substitute system. Transl. by G.G.

N74-31038# Technische Hochschule, Darmstadt (West Germany).
THE APPROXIMATIVE SOLUTIONS FOR MIXED BOUNDARY VALUE PROBLEMS IN QUASILINEAR ELLIPTICAL DIFFERENTIAL EQUATIONS Ph.D. Thesis [DIE APPROXIMATION DER LOESUNGEN GEMISCHTER RANDWERTPROBLEME QUASILINEARER ELLIPTISCHER DIFFERENTIALGLEICHUNGEN]
Hans-Detlef Mittelmann 1973 81 p refs In GERMAN
Avail: NTIS HC $7.25

A mathematical procedure for solving mixed boundary value problems is presented. Systems of integral equations and mathematical matrices are developed and the relationships of the parameters are analyzed. A theoretical discussion of the mathematical processes is included. Specific applications to analyze the characteristics of fluid flow under various conditions are explained. Author

N74-31039*# Scientific Translation Service, Santa Barbara, Calif.
DIGITAL SIMULATION OF RANDOM PERTURBATION VARIABLES
M. Zindel Washington NASA Jul. 1974 46 p Transl. into ENGLISH from German report DLR-Mitt-70-12 Presented at the meeting of the DGLR Sci. Comm. on Flight Performance and Flight Characteristics, Darmstadt, 12-13 nov. 1970
(Contract NASw-2483)
(NASA-TT-F-15795; DLR-Mitt-70-12) Avail: NTIS HC $5.50 CSCL 12A

The digital production of stationary random number sequences with prescribed static properties is described and the role of statistical prediction is explained. The generalization to vectors is discussed and examples of each concept are provided. Author

N74-31040*# Kanner (Leo) Associates, Redwood City, Calif.
NECESSARY AND SUFFICIENT CONDITIONS OF ABSOLUTE ASYMPTOTIC STABILITY OF LINEAR SYSTEMS OF DIFFERENTIAL EQUATIONS WITH CONSTANT DELAY
B. Koval and Ye. Tsarkov Washington NASA Jul. 1974 8 p refs Transl. into ENGLISH from Dopovid. Akad. Nauk Ukr. RSR, Ser. A. Fizikotekhn. Mat. Navukovi (Kiev), v. 34, Jun. 1972 p 506-509
(Contract NASw-2481)
(NASA-TT-F-15830) Avail: NTIS HC $4.00 CSCL 12A

Necessary and sufficient conditions are determined for the asymptotic stability of a trivial solution for linear systems of differential equations and linear equations of the N-th order with arbitrary constant delay delta > 0. Author

N74-31041# Elektronikcentralen, Hoersholm (Denmark). Danish Research Centre for Applied Electronics.
FRAES: DESCRIPTION OF ADVANCED ALGORITHMS FOR TRACING, CONTROL, AND INTERPOLATION [BESKRIVELSE AF AVANCEREDE ALGORITMER FOR UDJAEVNING, STYRING OG INTERPOLATION]
J. Wested Mar. 1974 40 p in DANISH; ENGLISH summary (ECR-39) Avail: NTIS HC $5.00

A series of BASIS programs are reported that give better curve control than programs known so far. Curves more or less crumpled can be generated on the basis of a few given points as input. The curves can be produced as mathematical exact two times differentiable curves with continuous second derivatives, i.e. the tangential slopes and the curvatures for the curve are continuous. The programs can be used for advanced control of robots, automatic control of vehicles or farm implements, precision interpolation for machine tools (millers), or systematic selection of experimental parameters. Author

N74-31042*# Northrop Services, Inc., Huntsville, Ala.
A STUDY OF TWO STATISTICAL METHODS AS APPLIED TO SHUTTLE SOLID ROCKET BOOSTER EXPENDITURES
M. Perlmutter, Y. Huang, and M. Graves Jul. 1974 28 p refs (Contract NAS8-21810)
(NASA-CR-129032) Avail: NTIS HC $4.50 CSCL 12A

The state probability technique and the Monte Carlo technique are applied to finding shuttle solid rocket booster expenditure statistics. For a given attrition rate per launch, the probable number of boosters needed for a given mission of 440 launches is calculated. Several cases are considered, including the elimination of the booster after a maximum of 20 consecutive launches. Also considered is the case where the booster is composed of replaceable components with independent attrition rates. A simple cost analysis is carried out to indicate the number of boosters to build initially, depending on booster costs. Two statistical methods were applied in the analysis: (1) state probability method which consists of defining an appropriate state space for the outcome of the random trials, and (2) model simulation method or the Monte Carlo technique. It was found that the model simulation method was easier to formulate while the state probability method required less computing time and was more accurate. Author

N74-31043# Joint Publications Research Service, Arlington, Va.
FIRST ALL-UNION SYMPOSIUM: METHODS OF REPRESENTATION AND THE MACHINE ANALYSIS OF RANDOM PROCESSES AND FIELDS
10 Jul. 1974 149 p refs Transl. into ENGLISH of "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 1-148
(JPRS-62432) Avail: NTIS HC $10.50

The proceedings of a conference on methods of representation and the machine analysis of random processes and fields are presented. A review is made of contemporary problems of statistical measurements and methods of representing stationary random processes and fields. The techniques for measuring the parameters and characteristics of the random processes and fields are reported. For individual titles, see N74-31044 through N74-31071.

N74-31044 Joint Publications Research Service, Arlington, Va.
PROBLEMS OF THE METHODOLOGY OF RANDOM PROCESSES AND FIELDS
A. F. Kotyuk and V. V. Olshevskiy *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 1-14 Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 1-17 (For availability see N74-31043 20-19)

The characteristics and functions of a statistical measuring system (SIS) are discussed. The main difficulty in the analysis and synthesis of an SIS with assigned metrological parameters is that there is no acceptable classification of random processes and fields and of their statistical characteristics. The problem of SIS analysis and synthesis is essentially the central problem in the formulation and conduct of experimental investigations into the statistical characteristics of random processes and fields. The basic tasks which should be carried out by means of an SIS are defined. A functional diagram of an SIS is developed. Author

N74-31045 Joint Publications Research Service, Arlington, Va.
PROBLEMS OF THE MACHINE APPROXIMATION OF THE CHARACTERISTICS OF STOCHASTIC PROCESSES c08

V. Ya. Rozenberg *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 15-25 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 17-27 (For availability see N74-31043 20-19)

The machine analysis of stochastic processes is discussed. Emphasis is placed on the derivation of laws governing probability distribution, correlation functions, and energy spectra, the measurement of distribution moments and correlation intervals, and the smoothing and centering of processes. Problems of optimal signal detection and measurement of signal parameters in the presence of interference which are related to the requirements of radar are examined. The methods and means of conducting the required measurements are reported. The problems of coordinated measurement are analyzed. Mathematical models are developed to show specific applications of the problem solving techniques. Author

N74-31046 Joint Publications Research Service, Arlington, Va.
THE PROBLEM OF THE ACCURACY OF STATISTICAL MEASUREMENTS

A. F. Kotyuk and V. V. Olshevskiy *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 26-30 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 28-32 (For availability see N74-31043 20-19)

The problem of the accuracy of measurements of the statistical characteristics of stochastical processes for solving theoretical and practical tasks of the metroiogy of random processes and fields is discussed. A procedure for measuring some characteristics of the specific process is developed. Four types of probability distribution involved in the measuring process from probabilistic positions are defined. Curves are provided to show the distribution of estimates and results of the measurements of the investigated characteristics. It is stated that in measurements of any statistical characteristics the finite nature of the amount of initial data and the noise level utlimately determine the potential quality of measurement. Author

N74-31047 Joint Publications Research Service, Arlington, Va.
PROBLEMS OF THE STATISTICAL DESCRIPTION OF EVOLUTIONARY AND NONERGODIC STOCHASTIC PROCESSES

V. V. Olshevskiy and E. I. Tsvetkov *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 31-34 ref Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 33-36 (For availability see N74-31043 20-19)

In mathematical statistics stochastic processes are divided into stationary and evolutionary on the one hand, and into ergodic and nonergodic on the other. There is much in common between the properties of stationary and ergodic states. A stationary state signifies a stability (permanency, independence) of current statistical characteristics with respect to time, while an ergodic state signifies the stability (permanence, independence) of average statistical characteristics in a model space. However, because of the accepted methods of defining statistical characteristics as the results of averaging either on the basis of an ensemble (current statistical characteristics) or on the basis of the infinite nature of time (average statistical characteristics), stationary and ergodic states do not fully depict the stability of a process under investigation. The type of realizations of an ergodic process may differ substantially, but /on the average/ they prove to be adequate, or more accurately their average statistical characteristics have one and the same value. Similarly, the totally different development of individual models in time does not contradict the equality of the results of ensemble averaging. Author

N74-31048 Joint Publications Research Service, Arlington, Va.
ADAPTIVE METHODS OF MINIMIZING ERRORS IN STATISTICAL MEASUREMENTS

V. V. Olshevskiy *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 35-41 Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 37-43 (For availability see N74-31043 20-19)

In the machine determination of the current statistical characteristics of a stationary random process the problem of minimizing methodological errors arises. The essence of such minimization reduces to selecting parameters for the processing system for the input process that are optimal in some regard. As a rule, prior to conducting processing the experimenter obtains certain a priori information on the class of the process under investigation, but knows very little indeed about the specific type of the characteristic under study. The parameters are selected on the basis of a priori information, after which statistical processing of the process takes place. At the same time, in addition to these data additional information on the characteristics of the process under investigation is obtained. The use of such current information is made the basis for the application of adaptive methods of minimizing measuring errors and selecting optimal parameters for the data processing devices of a statistical measuring system. Author

N74-31049 Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF THE QUALITY OF COMPLEX SYSTEMS (A SURVEY) **c08**

G. Ya. Goldshteyn *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 42-46 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Projtsessov i Poley" Novosibirsk, 1968 p 44-48 (For availability see N74-31043 20-19)

Problems of the machine analysis of random fields in connection with the creation of complex systems are discussed. The systems considered contain a large number of elements characterized by hierarchic order and large internal data flows. The information-logic circuits of such systems generally contain data processing units, solving devices, and controls connected by data transmission channels and control channels. The optimal planning of such systems consists in achieving the maximum output effect with the means available to the developer. Under this dual task it is necessary to achieve a certain level of output with minimal expenditures. The basic categories of information which are applied to the design of a complex device are identified. Author

N74-31050 Joint Publications Research Service, Arlington, Va.
THE RELATION BETWEEN THE CRITERION FOR ASSESSING THE QUALITY OF AN INDIVIDUAL DEVICE AND THE CRITERION FOR ASSESSING THE QUALITY OF THE SYSTEM TO WHICH IT BELONGS

N. A. Rubichev *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 47-51 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 49-52 (For availability see N74-31043 20-19)

The criteria for assessing the quality of a signal processing system are discussed. For an assigned criterion for assessing the quality of a system, the criteria of the quality of individual devices are determined by the structure of the system and by the assigned criterion. The criteria obtained have a complex form. Simplification of the criteria is possible on the assumption that all devices except the one under study are ideal. If the criteria are used to optimize devices or to test them for suitability, then it is possible to replace one criterion with another that satisfies certain requirements. Author

N74-31051 Joint Publications Research Service, Arlington, Va.
CRITERIA OF OPTIMALITY AND THE SYNTHESIS OF OPTIMAL ALGORITHMS IN THE MEASUREMENT OF THE PARAMETERS OF STATIONARY ACOUSTIC FIELDS

V. A. Lerner, R. I. Eykhfeld, and A. A. Yanpolskiy *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 52-56 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 53-56 (For availability see N74-31043 20-19)

The criteria for determining the parameters of stationary acoustic fields are discussed. Application of the criteria to synthesizing an optimal measuring track is analyzed. An optimal measuring track is defined as a complex of devices that ensure an assigned accuracy and reliability of measurement for the methods employed and a minimum of volume of processed information. A mathematical model is developed to show the conditions for the assigned accuracy and reliability of measurements for a finite sample size. Specific examples of the various

laws which apply to acoustic measurements are examined.
Author

N74-31052 Joint Publications Research Service, Arlington, Va.
DESCRIPTION AND MEASUREMENT OF THE STATISTICAL CHARACTERISTICS OF RANDOM FIELDS CREATED BY MULTIPLE SOURCES
V. V. Olshevskiy *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 57-63 Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 57-63 (For availability see N74-31043 20-19)

The statistical characteristics of random fields created by multiple sources are discussed. A random field is defined as some random function that depends on time and the coordinates of the observation point. The procedure for investigating the random fields of various physical natures is described. Mathematical models are presented to show some aspects of the description of random fields. The problems of the completeness of the satistical description of fields can in principle be extended to distributions of orders higher than two dimensional. Author

N74-31053 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE SPATIAL DISTRIBUTION OF SOURCES IN TERMS OF THE STATISTICAL CHARACTERISTICS OF THE FIELD CREATED BY THEM
V. V. Olshevskiy *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 64-70 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 64-70 (For availability see N74-31043 20-19)

The direct problems of the statistical analysis of random fields which reduce to the determination of the spatiotemporal characteristics of the field with respect to the known spatiotemporal characteristics of the sources are discussed. In various experimental investigations the characteristics of the field on whose basis and with an assigned model various properties of the sources can be determined are usually to be measured. Such problems are known as inverse problems. The formulation of one class of inverse problems of the statistical analysis of random fields is considered. The possibilities for their solution by using the method of resolving them into series on the basis of orthonormalized functions are examined. Author

N74-31054 Joint Publications Research Service, Arlington, Va.
STATISTICAL ASPECTS OF THE METEOROLOGICAL ANALYSIS OF INDUCTIVE AERIAL GEOPHYSICAL EXPLORATION SCHEMES c13
A. F. Kotyuk *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 71-77 ref Transl. into ENGLISH of "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 71-78 (For availability see N74-31043 20-19)

The problems involved in adapting airborne geophysical exploration equipment to meteorological investigations are analyzed. The development of methods of mathematical and physical modeling of processes that transpire in aerial electric geophysical exploration schemes is explained. Mathematical models are developed to show the signal processing capabilities which are required. The numerical analysis procedure leads to the possibility of studying the correlation function of the random process which represents a fluctuating voltage at the terminals of the receiving dipole and the effectiveness of the sampling equipment. Author

N74-31055 Joint Publications Research Service, Arlington, Va.
CERTAIN PROBLEMS OF THE STATISTICAL ESTIMATION OF THE ANGULAR PARAMETERS OF PHASE FRONTS OF PHYSICAL FIELDS
A. M. Zufrin *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 78-82 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 79-84 (For availability see N74-31043 20-19)

Measurements of the angular parameters of the phase fronts of physical fields are discussed. The parameters are statistical in character under real conditions. This is due to the influence of additive interference and to the random motion of signal sources and the heterogeneity of the environment. The mathematical relationship which determines the angle of arrival of the phase front of a signal is developed. A method for conducting an error analysis is explained. Specific examples of the mathematical applications are included. Author

N74-31056 Joint Publications Research Service, Arlington, Va.
BEARING CHARACTERISTICS FOR SOME STATISTICAL MODELS OF SPATIALLY DISTRIBUTED SIGNAL SOURCES c07
V. I. Vorobyev and V. G. Solonenko *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 83-86 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 85-88 (For availability see N74-31043 20-19)

The characteristics of radar direction finding systems are discussed. The principle of instantaneous comparison of signals is described. According to this principle, the direction of source electromagnetic waves is determined from the result of a comparison of signals received simultaneously through several space channels. Mathematical models are developed to find the statistical characteristics of the process for a continuous model of a radar source having an arbitrary spatial correlation. Author

N74-31057 Joint Publications Research Service, Arlington, Va.
LINEAR MAPPING OF A RANDOM PROCESS THAT REPRESENTS RANDOM REFLECTIONS c13
V. F. Chudesenko *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 87-89 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 89-92 (For availability see N74-31043 20-19)

A phenomenological model of reflections from a spatially distributed multiple-point object is examined. The form of the irradiating signal is assumed to be arbitrary. On the basis of the method of canonical expansion the correlation function of a random process at the output of an arbitrary linear filter is calculated. The correlation function is expressed in terms of the so-called reflection distribution function (FRO) and the two-dimensional correlation characteristics of the signal and of the pulse reaction of the filter. The results obtained may find application in radar and hydroacoustics. Author

N74-31058 Joint Publications Research Service, Arlington, Va.
CERTAIN TYPES OF AMPLITUDE ALGORITHMS FOR DETERMINING THE PHASE FRONTS OF STATIONARY RANDOM FIELDS
D. Ye. Minskiy and G. I. Ovchinnikov *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 90-93 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 93-97 (For availability see N74-31043 20-19)

The use of phase processing algorithms to isolate information on the angles of arrival of phase fronts of noise signals is discussed. The use of amplitude algorithms is examined for the two-channel amplitude processing of a broadband signal received by a linear equidistant antenna grid. A mathematical model is developed based on the premise that the signal and noise are normal, stationary, and independent processes. A system of single channel amplitude processing by means of clipping in the channel of each antenna element is described. The advantages of using the clipping for a two-channel amplitude processing system are analyzed. Author

N74-31059 Joint Publications Research Service, Arlington, Va.
EXCITATION AND RADIATION OF LINEAR OSCILLATING SYSTEMS HAVING DISTRIBUTED PARAMETERS BY A SYSTEM OF RANDOM SPATIAL PERTURBATIONS
V. I. Klyachkin *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 94-99 Transl. into ENGLISH from "Pervyy Vsesovvznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 98-103 (For availability see N74-31043 20-19)

A method of solving problems involving the characteristics of linear oscillating systems is presented. The specific application to determining the second spatial statistical moments of fields radiating from elastic shells is emphasized. The mathematical

applications are based on using heterogeneous Helmholtz equations to determine the radiating fields in the external and internal regions. The equations are then solved through formalization of the Green functions of Neumann's internal and external problems. It is stated that the given method may be used to investigate the statistical field of any linear system having distributed parameters when a proper selection is made of the boundary operator and of the boundary conditions corresponding to the problem. Author

N74-31060 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF FUNCTIONS OF THE SPATIAL CORRELATION OF A FIELD IN THE SPACE BETWEEN AN ELASTIC PLATE AND A RIGID SCREEN IN TERMS OF A KNOWN (MEASURED) FUNCTION OF SPATIAL CORRELATION IN ONE CROSS-SECTION OF THIS SPACE c32
V. I. Klyachkin and R. A. Sokolova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 100-103 Transl. into ENGLISH from "Pervyy Vsesoyvznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 104-107 (For availability see N74-31043 20-19)

A numerical method for analyzing the flexural oscillations of an infinite thin elastic member under the influence of a random stationary homogeneous or isotropic force field is presented. By solving the direct oscillatory problem, the spectral amplitudes of pressure in the space between the plate and the rigid screen and the normal displacements of the plate are determined. Curves are presented to show the dependence of the correlation coefficient on the distance to the plate and the dependence of noise level on the distance to the plate. Author

N74-31061 Joint Publications Research Service, Arlington, Va.
CORRELATION CHARACTERISTICS OF A PRESSURE FIELD IN THE SPACE BETWEEN TWO OSCILLATING INFINITE PLATES c23
V. I. Klyachkin and B. N. Platunova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 104-106 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 108-110 (For availability see N74-31043 20-19)

The problem of determining the correlation coefficient of a pressure field that arises between elastic infinite plates, each of which is excited by a set of distributed random forces is considered. Here it is assumed that both plates are thin. The external space from the direction of the plate and the space between the plates represent an aqueous medium while the external space from the direction of one plate is a vacuum. The solution to this problem is reached according to methods constructed on the use of Green functions. Author

N74-31062 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE RADIATION FIELD OF A CYLINDRICAL SHELL EXCITED BY RANDOM FORCES c32
G. I. Usoskin *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 107-110 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 111-114 (For availability see N74-31043 20-19)

The statistical properties of a radiation field within a closed cylindrical shell excited by random forces are considered. The general case in which an acoustically rigid cylindrical screen is located within a cylindrical shell and is coaxial with it is analyzed. The vibrational field of the shell is also investigated. It is assumed that the statistically independent forces have a uniform intensity over the surface and act on a thin' closed cylindrical shell of infinite length. Based on the reaction of the medium, the relative spectrum of the field of flexural oscillations can be expressed in terms of the corresponding Green function. Author

N74-31063 Joint Publications Research Service, Arlington, Va.
CERTAIN PROBLEMS OF THE REPRESENTATION OF SCATTERED SIGNALS FOR THE PURPOSE OF ANALOGUE MODELING c07
N. S. Gubonin *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 111-114 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 115-118 (For availability see N74-31043 20-19)

A mathematical model which represents the scattering of radar waves from a complex target, such as an aircraft, or an artificial earth satellite is developed. A system of point scatters is represented by a simple target to reduce the complexity of the problem. The use of the mathematical model makes it possible to describe all types of fluctuations of reflected signals at the point of reception. The advantages and disadvantages of the system of mathematical models are explained. Author

N74-31064 Joint Publications Research Service, Arlington, Va.
ESTIMATION OF THE ACCURACY OF REPRESENTATION OF FLOWS OF HOMOGENEOUS EVENTS DURING QUANTIFICATION OF READING TIMES
Ye. A Obidenko and L. I. Torokhova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 115-117 Transl. into ENGLISH from "Pervyy Vsesoywznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 119-121 (For availability see N74-31043 20-19)

The characteristics of equipment which is used to assess the flows of homogeneous events are discussed. The equipments are those similar to pulse counters, and shift registers. The quality of the estimation of the characteristics of a flow depends on the accuracy of the representation of the flow in the equipment. The higher the frequency of quantification, the greater the accuracy. As the frequency of quantification increases the equipment for processing flows becomes more complicated. Mathematical models are developed to analyze the degree of complexity consistent with accuracy. Author

N74-31065 Joint Publications Research Service, Arlington, Va.
THE MODELING OF FLOWS OF HOMOGENEOUS EVENTS
Ye. A. Obidenko and L. I. Torokhova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 118-119 Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 122-123 (For availability see N74-31043 20-19)

Numerical analyses of the characteristics of flows of homogeneous events were conducted to examine complicated flow conditions. Mathematical models are developed for cases in which the following conditions exist: (1) the initial flow is not a Poisson flow; (2) two initial flows in which the secondary is less intensive than the primary; (3) two secondary flows; and (4) a flow of paired pulses with alternating primary and secondary flows. Author

N74-31066 Joint Publications Research Service, Arlington, Va.
MACHINE RECOGNITION OF SITUATIONS IN FLOWS OF HOMOGENEOUS EVENTS c08
Ye. A. Obidenko and L. I. Torokhova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 120-121 Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 124-125 (For availability see N74-31043 20-19)

The representation of the flow of homogeneous events by a flow of brief electrical impulses is discussed. Three recognition units are developed. The first unit is designed to single out situations in which the duration, the number of pulses, and the interpulse intervals are given. The second unit is a case where the duration of the situation is divided into two identical time intervals, and the recognition circuit reacts to the ratio of the number of pulses in these intervals. The third unit is divided into two different intervals which consist of not more than two pulses per interval. The circuits for analyzing the flow conditions are included. Author

N74-31067 Joint Publications Research Service, Arlington, Va.
A THEOREM OF THE QUANTIFICATION OF A RANDOM PROCESS
Yu. P. Drobyshev *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 122-125 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 126-129 (For availability see N74-31043 20-19)

A method of quantifying a continuous signal by representing

it in successive intervals using segments of functional series is described. Mathematical models are developed to analyze the dispersion of the coefficients. The theorem for a class of stationary random processes with zero mathematical expectation is proven. The proof of the theorem for random processes is also applicable to trigonometric polynomials. Author

N74-31068 Joint Publications Research Service, Arlington, Va.
ON THE PROBLEM OF MEASUREMENTS IN AN INACCESSIBLE DOMAIN c15
D. G. Levchenko *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 126-129 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Polye" Novosibirsk, 1968 p 130-133 (For availability see N74-31043 20-19)

The problem of the separate measurement of signals whose sources are located in an inaccessible or hard-to-reach domain is discussed. The solution of the problem of the separate measurement of signals breaks down into a number of stages. Mathematical models are developed to show the value of a signal from a given source and the relationships of the parameters for signal analysis. It is shown that to determine the number of independent divisible signal sources in an inaccessible domain, the number of receivers should be gradually increased. The highest rank obtained will be that which is equal to the number of independent distinguishable sources. Author

N74-31069 Joint Publications Research Service, Arlington, Va.
EFFECT ON RANDOM PULSE SEQUENCE ON A SYSTEM HAVING A CADENCE MODE OF OPERATION
V. N. Medvedez *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 130-132 ref Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstakleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 134-135 (For availability see N74-31043 20-19)

The application of a superregenerative amplifier operating under a sequence of radio pulses for analyzing random signals is discussed. The establishment of the amplitude of oscillations in such an amplifier are described by a differential equation. Mathematical models are developed to show the relationships of the various parameters. The proposed mathematical model can also be used for examining the process of data transmission in a shift register and in investigating the process of limitation in an amplitude sector. Author

N74-31070 Joint Publications Research Service, Arlington, Va.
ONE METHOD OF REPRESENTING A FIELD IN A MEDIUM LIMITED BY A STATISTICALLY UNEVEN SURFACE
V. M. Kudryanov *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 132-139 refs Transl. into ENGLISH from "Pervyy Vsessoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 136-141 (For availability see N74-31043 20-19)

A sound field is represented in a medium limited by a statistically uneven surface in the form of a sum of the regular and random components. The methods of calculating the field are extremely diverse and the selection of a given method is dictated by the greatest efficiency. The selection is influenced by the uneven boundary, the characteristics of the medium, and the location of the corresponding points. Mathematical models are developed to define the boundary conditions and to show the attenuation of the average field under various conditions. Author

N74-31071 Joint Publications Research Service, Arlington, Va.
NUMERICAL CHARACTERISTICS OF SOME RANDOM FUNCTIONS THAT CONTAIN PERIODIC COMPONENTS
I. A. Aleksandrov *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 139-145 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 142-148 (For availability see N74-31043 20-19)

In making various radio engineering measurements it is often necessary to deal with signals that represent a mixture of noise and periodic or quasiperiodic components. In connection with this, the problem of the statistical description of such processes is extremely pressing. The results of a computation of the unidimensional probability densities and numerical characteristics of the distributions for some particular cases of a mixture of normal noise and periodic (or in general quasiperiodic) components are presented. Author

N74-31072# Cornell Univ., Ithaca, N.Y. Dept. of Operations Research.
A CONDITION FOR REALIZABILITY OF A SEQUENCE BY A HAMILTONIAN GRAPH
Michael Koren Nov. 1973 13 p refs
(Contract N00014-67-A-0077-0014)
(AD-774970/8; TR-205) Avail: NTIS HC $3.00 CSCL 12/1

Erdos and Gallai characterized in a previous paper (1960) the sequences of integers which are realizable by (i.e., to be the degree sequence of) a simple graph. In this paper the author gives a constructive proof to their theorem and uses this method of proof to obtain a sufficient condition for a sequence to be realizable by a Hamiltonian graph. (Modified author abstract) GRA

N74-31073# Wisconsin Univ., Madison. Dept. of Computer Sciences.
DISCRETE MECHANICS: A GENERAL TREATMENT
Robert A. LaBudde and Donald Greenspan Dec. 1973 75 p refs
(PB-231882/2; WIS-CS-192-73) Avail: NTIS HC $3.75 CSCL 20J

A new numerical method for use in the solution of classical equations of motion is described, accurate to third-order in the coordinates and second-order in the velocities. The method has the unique property of preserving the energy and total linear and angular momenta at their initial values in the computation. This discrete mechanics is derived from general symmetry properties of the equations of motion and is compared in several numerical examples with conventional predictor-corrector methods. The theory is applied to derive a general expression for the impulsive limit of motion due to a potential. Author (GRA)

N74-31170 Joint Publications Research Service, Arlington, Va.
OPTIMAL PROCESSING OF NONSTATIONARY RANDOM HYDROACOUSTIC SIGNALS
V. V. Solodovnikov and V. F. Biryukov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 25-35 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 23-32 (For availability see N74-31167 20-23)

N74-31171 Joint Publications Research Service, Arlington, Va.
SOME INTEGRAL RELATIONS CONNECTED WITH RANKING THE COMPONENTS OF A RANDOM VECTOR
I. P. Yudenkov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 36-39 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 33-35 (For availability see N74-31167 20-23)

N74-31174 Joint Publications Research Service, Arlington, Va.
SPECTRAL REPRESENTATION OF NONSTATIONARY RANDOM PROCESSES
V. A. Geranin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 66-79 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 60-75 (For availability see N74-31167 20-23)

N74-31177 Joint Publications Research Service, Arlington, Va.
DIGITALIZATION OF A HYDROACOUSTIC SIGNAL
V. V. Petrov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 99-102 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 93-95 (For availability see N74-31167 20-23)

N74-31194 Joint Publications Research Service, Arlington, Va.
APPLICATION OF CEPSTRAL ANALYSIS IN PROCESSING HYDROACOUSTIC SIGNALS
I. Vorobyev *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 238-242 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 251-255 (For availability see N74-31167 20-23)

N74-31195 Joint Publications Research Service, Arlington, Va.
ALGORITHM FOR DETECTING A SIGNAL IN NOISE OF UNKNOWN INTENSITY
A. N. Orlichenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 243-250 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 256-264 (For availability see N74-31167 20-23)

N74-31200 Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF ESTIMATING THE UNKNOWN PARAMETER IN A HYDROACOUSTIC MEASUREMENT PROBLEM
V. I. Paderno and I. R. Romanovskaya *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 279-285 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 294-299 (For availability see N74-31167 20-23)

N74-31204 Joint Publications Research Service, Arlington, Va.
INCREASING THE ACCURACY OF CALCULATING THE HIGHER ORDER MOMENTS OF RANDOM PROCESSES WITH A FINITE RANGE OF VALUES
V. S. Miroshnichenko and V. K. Ponomarenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 306-311 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 322-327 (For availability see N74-31167 20-23)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-31074 Illinois Inst. of Tech., Chicago.
INCOHERENT RADAR MEASUREMENT OF ATMOSPHERIC TURBULENCE Ph.D. Thesis
Carl Ying-Yu Yang 1973 108 p
Avail: Univ. Microfilms Order No. 74-17020

One measure of atmospheric turbulence is the difference in the mean radial velocities of scatters in two spatial pulse volumes along the radar beam. Doppler radar systems are phase coherent since the transmitted pulses are time samples of a continuous sinusoidal wave. It is this property which enables such radars to sense the pulse-to-pulse phase shifts in target returns and thereby measure target velocity. In an incoherent radar, each transmitted pulse is generated with an arbitrary or random phase with the result that the velocity sensing capability is lost. A method is given here which enables incoherent radars to measure the difference in the average radial velocities of scatters in two spatial pulse volumes located simultaneously in the radar beam. This method is based upon the fact that, although successive transmitted pulses from an incoherent radar are phase incoherent, the signals returned on any one pulse from a pair of pulse volumes are relatively coherent. Dissert. Abstr.

N74-31075 British Library Lending Div., Boston Spa (England).
STUDY OF ANNUAL MAXIMUM WIND SPEEDS APPLICATION TO THE DETERMINATION OF WIND SPEEDS FOR THE CALCULATION OF WIND-LOADING
P. Duchene-Marullaz [1972] 45 p refs Transl. into ENGLISH from Cahiers Centre Sci. Tech. Batiment (Paris), No. 131, 1972 In ENGLISH and FRENCH
(BLL-M-23277-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

Wind speeds and their effects on building construction and safety features were investigated using data collected by several weather stations. Instantaneous maximum wind speeds were studied in order to determine the values of wind speeds which permit wind loading calculations by application of various coefficient characteristics of the site, the type of construction considered, and the safety factor desired. Author

N74-31076 British Library Lending Div., Boston Spa (England).
ON THE VERTICAL TEMPERATURE GRADIENT IN THE MOUNTAINS OF SOVIET CENTRAL ASIA
N. V. Davidovic [1972] 25 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Mezd. Geof. Kom., Data Glaciol. Stud. (Moscow), v. 19, 1972 p 59-67
(BLL-M-23212-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Data from 10 pairs of stations, which differed more than 1000 m in altitude, and were within 160 km of each other were analyzed to determine the gradient. It was found that the mean temperature gradient is 0.6/100m for the year (max is 0.7C in June, and 0.5C in January). The time of year, and the geographical location of the station must be considered in the reduction. F.O.S.

N74-31077 British Library Lending Div., Boston Spa (England).
ON PRESSURE VARIABILITY IN THE NORTHERN HEMISPHERE AND ITS CONNECTION WITH PROCESSES IN THE OCEAN
V. N. Moreckij [1974] 13 p refs Transl. into ENGLISH from Issled. Arkt. Antarkt. Nauchn. (USSR), v. 306, 1972 p 24-29 In ENGLISH and RUSSIAN
(BLL-M-23214-(5828.4F)) Avail: British Library Lending Div., Boston, Spa, Engl.: 2 BLL photocopy coupons

A statistical analysis of atmospheric formations based on mean monthly air pressure values for the period 1940 to 1970 is presented. The fundamental parameters studied were identified as centers of action in the far Northern Hemisphere. The relationships between pressure variations at the centers and shifts in their latitudes and longitudes were computed. Seasonal and subannual variability of barometric centers were then computed and correlated with the timing of extreme values in the seasonal variation of ocean currents in the same region. A.A.D.

N74-31078 British Library Lending Div., Boston Spa (England).
ON THE PROBLEM OF CONNECTIONS BETWEEN CLIMATIC VARIATIONS AND THE SOLAR CONSTANT DURING THE LAST TWO CENTURIES
O. A. Drozdov [1974] 12 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., no. 24, 1972 p 99-102 In ENGLISH and RUSSIAN
(BLL-M-23213-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The important theories on the connection between the solar constant and regional climatic variations are reviewed and assessed, and a tentative 80 year cyclic temperature fluctuation is identified which corresponds to the large fluctuations of the astronomical values of the solar constant which are revealed by observations made from earth. The relation of explosive volcanic eruptions and global secular variations in direct radiation is also discussed, and certain outstanding trends in the warming or cooling of the climate are identified along with their approximate dates. A.A.D.

N74-31079 British Library Lending Div., Boston Spa (England).
ON THE PROBLEM OF THE CONJUCTION OF ATMOSPHERIC PROCESSES IN THE ATLANTIC-EURASIAN AND THE PACIFIC OCEAN-AMERICAN SECTORS IN THE COLD HALF-YEAR
A. A. Dmitriev and P. A. Selcer [1974] 16 p refs Transl. into ENGLISH from Issled. Arkt. Antarkt. Nauchn. (Leningrad), v. 313, 1972 p 71-78 In ENGLISH and RUSSIAN
(BLL-M-23280-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Statistical studies of the Atlantic-Eurasian and the Pacific-American atmospheric circulation were conducted to obtain 3 to

10 day forecasts of the Arctic winter circulation. The mean monthly number of days for a pattern of circulation, and the probability of its occurrence were determined for both sectors. It is concluded that, during the winter, there is a correlation between the two sectors, and the influence should be considered in Arctic weather forecasts. F.O.S.

N74-31080 British Library Lending Div., Boston Spa (England).
ADIABATIC AND ISOBARIC MIXING OF MOIST AIR AND WATER OR ICE
L Dufour [1968] 43 p refs Transl. into ENGLISH from Inst. Roy. Met. Belgique (Brussels), Publ. Ser. B., no. 68, 1972 In ENGLISH and FRENCH
(BLL-M-23210-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

The range of equations and definitions related to the study of adiabatic and isobaric mixing of moist air and water or ice is reviewed. The case where the air temperature is different from that of water or ice is considered in a general equation expressing the thermodynamics of closed polythermal systems. The thermodynamic temperature of the wet-bulb thermometer, and of an ice covered thermometer, was investigated for the case where the temperature of the water or ice remains constant. Saturation characteristics are also discussed for the case where the temperature of the water or ice is variable, and for the case where the air temperature is the same as that of the water or ice. Both the isenthalpic saturation and the isenthalpic evaporation of a mass of moist air are considered in the discussion. The different approximations which can be made for the equations defining the invariants of the isenthalpic transformations are shown. A.A.D.

N74-31081# Hosei Univ., Tokyo (Japan). Dept. of Geography.
STUDIES ON BORA (3) Climatological Notes No. 15
1973 50 p
Avail: NTIS HC $5.50

Local climatological observations of the bora winds were carried out in Kroatia, Yugoslavia during the period from November 10 to December 20, 1972, and in Slovenia, Yugoslavia during the period January 6 to 28, 1973. Moving observations of the wind speed and direction were measured and are shown in tabular form. Synoptic situations associated with anticyclonic developments were also observed and recorded in the form of wind charts. For individual titles, see N74-31082 through N74-31083.

N74-31082 Hosei Univ., Tokyo (Japan).
OBSERVED RESULTS OF BORA WINDS IN SENJ AND AJDOVSCINA REGIONS, YUGOSLAVIA, 1972-1973
M. Yoshimura and K. Nakamura *In its* Studies on Bora (3) 1973 p 1-39 (For availability see N74-31081 20-20)

The observed results of bora wind measurments for Senj, in the Kroatia region of Yugoslavia, and Ajdovscina, in the Slovenia region of Yugoslavia, are presented. The observations were carried out from November 1972 to January 1973 under the cooperation of Yugoslavian and Japanese scientists at fixed stations as well as automobile observatories. The results of the observations at fixed stations are shown in the tables of hourly mean wind speed and temperature, and those of moving observations are shown in tables of five minutes' mean wind speed and directions of prevailing wind. The original observed values are given for later analysis. Author

N74-31083 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
SYNOPTIC SITUATIONS DURING THE MEASUREMENTS OF BORA IN THE SENJ REGION IN NOVEMBER AND DECEMBER, 1972
O. Poje *In* Hosei Univ. Studies on Bora (3) 1973 p 39-48 (For availability see N74-31081 20-20)

A description of synoptic situations during the measurements of bora in the Senj region is presented. It is considered that the bora wind is mainly associated with anticyclonic development in SE Europe, and that in some cases the bora is part of an intense NE flow over the Balkan peninsula. Author

N74-31084# Hosei Univ., Tokyo (Japan). Dept. of Geography.
STUDIES ON BORA (2) Climatological Notes No. 14
1973 41 p refs
Avail: NTIS HC $5.25

Foehn winds observed in Yugoslavia, and Japan are analyzed. For individual titles, see N74-31085 through N74-31086.

N74-31085 Hosei Univ., Tokyo (Japan). Meteorological Coll.
NUMERICAL EXPERIMENTS OF THE LOCAL STRONG WINDS, BORA AND FOEHN
S. Arakawa *In its* Studies on Bora (2) 1973 p 1-20 refs (For availability see N74-31084 20-20)

Numerical experiments were conducted of the local strong winds, bora and foehn. Three dimensional shallow water equations are used as the governing equations and solved by means of difference method. The problem on the airflow around the isolated mountain is treated. The airflow tends to take routes around the mountain in the case of low speed flow in a stable layer. Consequently, the ground surface is exposed, because the lower layer, which covers the surface initially, is displaced. The exposed area, therefore, must be directly covered by the warm air superposed above the lower layer. Then, the foehn should be expected over this area. The currents in the lower layer converge on the mountain side. This is called a corner effect. In order to simulate the bora, a problem on the airflow through a mountain pass is treated secondly. The strong winds in the lower layer appear on the lee side of the pass in the case of thermally stable layer. Author

N74-31086 Hosei Univ., Tokyo (Japan).
LOCAL CLIMATOLOGICAL OBSERVATION MADE IN THE AJDOVSCINA REGION, SLOVENIA, IN NOVEMBER 1970
M. M. Yoshino, M. Yoshimura (Yamanashi Univ.), M. Owada (Aichi Univ. of Education), S. Ueda, S. Mitsui, and K. Mitsui *In its* Studies on Bora (2) 1973 p 21-40 refs (For availability see N74-31084 20-20)

The results are discussed of the local climatological observation made in November, 1970. The Ajdovscina region is located about 50km WSW of Ljubljana and about 30km NNE of Trieste. The wind distribution was observed at 20-27 points on the afternoon of November 8 and on the morning of November 24, 1970, by use of a portable anemometer installed on a two-meter pole. The observation results made clear the existence of the axis of wind maximum along the foot of mountains, which resulted from the NE wind, or the bora. The horizontal distance between the axis and the mountain ridge is 3-4km. Another region with a wind maximum appears also about 2km further leeward of this axis. Detailed distribution of wind conditions was studied at 80 points through the observation of grades of wind-shaped trees used as indicators. Author

N74-31087# RAND Corp., Santa Monica, Calif.
SAN DIEGO CLEAN AIR PROJECT: SUMMARY REPORT
Bruce F. Goeller et al Dec. 1973 144 p refs Sponsored by San Diego County and EPA
(R-1362-SD) Avail: NTIS HC $10.25

The San Diego Clean Air Project was undertaken to analyze alternative air pollution control strategies in terms of their various environmental, transportational, economic, and distributional impacts on San Diego, and to identify the most promising strategy for implementation. An overall strategy for the region, termed a mixed strategy, combines three types of pure strategy: (1) fixed-source controls (including aircraft because their significant emissions occur at or near airports); (2) retrofit devices and inspection/maintenance policies for light-duty motor vehicles; and (3) transportation management. A screening process was employed to compare prospective pure and mixed strategies as to their cost effectiveness and efficiency in reducing emissions, primarily of reactive hydrocarbons, the most serious pollutant in San Diego County. Nominal, medium, and maximal fixed-source control strategies are identified along with 28 possible retrofit strategies. Tentative decisions are reported and the problems in planning and implemantation of the project are outlined. Author

N74-31088# RAND Corp., Santa Monica, Calif.
COST AND EFFECTIVENESS OF STRATEGIES FOR REDUCING EMISSIONS FROM FIXED SOURCES: THE SAN

DIEGO AIR BASIN, 1975
J. C. Dehaven and B. M. Woodfill Dec. 1973 126 p refs Sponsored by San Diego County and EPA
(R-1363-SD/Append-1) Avail: NTIS HC $9.50

An analysis of fixed source air pollutants in the San Diego Air Basin was undertaken to establish costs and feasible tactics for reducing emissions. The initial step was to construct an inventory of emissions for 1970. The pollutants of interest are total and reactive hydrocarbons, oxides of nitrogen, carbon monoxide, sulfur oxide, particulates and, where appropriate, lead. Five emission sources emerged as the most important: (1) petroleum handling; (2) organic solvent use; (3) aircraft; (4) power plants; and (5) metallurgical processes. Together they account for over 95 percent of total and reactive hydrocarbons, about 90 percent of oxides of nitrogen and carbon monoxide, and about 75 percent of the sulfur dioxide emitted by fixed sources. The mineral industry and other point sources were also studied because of their high contribution of particulates. A nominal strategy representing expected conditions in the San Diego region in 1975 is forecast which reflects estimates of population and industrial growth rates, technological changes, and the effects of controls expected to be implemented. Other control strategies were also examined, particularly those most effective in reducing emissions of reactive hydrocarbons. Author

N74-31089# RAND Corp., Santa Monica, Calif.
THE MOTOR VEHICLE EMISSION AND COST MODEL (MOVEC): MODEL DESCRIPTION AND ILLUSTRATIVE APPLICATIONS
W. T. Mikolowsky Dec. 1973 98 p refs Sponsored by San Diego County and EPA
(R-1364-SD/Append-2) Avail: NTIS HC $8.00

The Motor Vehicles Emission and Cost Model (MOVEC) was developed and used primarily for evaluating light-duty motor vehicle (LDMV) retrofit and inspection/maintenance (retrofit-I/M) strategies. MOVEC calculates the LDMV emissions for all species, the total annualized costs (both purchase and operating) to the region, and the distribution of costs by income group under three alternative payment schemes for financing the retrofit-I/M strategy. MOVEC also considers the effect of average trip speed on emissions and the LDMV milage reductions necessary to meet the air quality standard for each species of pollutant.
Author

N74-31090# RAND Corp., Santa Monica, Calif.
A GENERALIZED BUS SYSTEM COST MODEL
R. L. Petruschell and T. F. Kirkwood Dec. 1973 99 p refs Sponsored by San Diego County and EPA
(R-1365-SD/Append-3) Avail: NTIS HC $8.00

A generalized bus system cost model was developed as one component of an overall methodology for analyzing alternative air pollution control strategies. Bus systems, with different vehicles, routes, and sizes, are components of such strategies. The bus system cost model described provides estimates of the true cost of providing a particular quantity and quality of bus service to a region, shows the sensitivity of cost to various changes in bus system design and operational policy, and in addition produces estimates of a variety of economic and and financial impacts such as employment, fuel consumption, and taxes. Initial investment costs are estimated and include the total costs of vehicles, yards and shops, other equipment, other facilities, and land. These initial investment costs are annualized into equal annual payments using a capital recovery factor approach. Recurring annual operating costs such as drivers' and helpers' wages, fuel expenses, equipment maintenance and garage are also estimated. All of the costs are then used to estimate net return on investment, depreciation, corporate profits taxes, and bond interest if dept financing is used. The model permits the user to specify both a useful life and a salvage value at the end of that time for each asset. Detailed and aggregate forms of the bus system cost model were developed. Author

N74-31091# RAND Corp., Santa Monica, Calif.
A POLICY-ORIENTED URBAN TRANSPORTATION MODEL: THE SAN DIEGO VERSION
J. H. Bigelow, B. F. Goeller, and R. L. Petruschell Dec. 1973 123 p refs Sponsored by San Diego County and EPA
(R-1366-SD/Append-4) Avail: NTIS HC $9.25

The transportation model described is a flexible policy-oriented tool useful for evaluating alternative transportation policies. It is flexible in that it treats a wide variety of transportation policies, such as increasing the area or frequency of bus system operations, making bus service free, reducing congestion, of imposing an added gasoline tax on autos to promote carpooling or bus usage. It is policy oriented in that it requires as input only an aggregate description of a transportation policy while it produces a wealth of output about the transportation service, environmental, economic, and distributional impacts of the policies being considered. The transportation model described simultaneously predicts changes in the total demand for person-trips and its split among modes (auto and bus) from changes in transportation service qualities (various costs and times). The submodel that carries out this function, the demand generator and modal split model, also predicts changes in auto occupancy (carpooling).
Author

N74-31092# RAND Corp., Santa Monica, Calif.
A TRADEOFF MODEL FOR SELECTING AND EVALUATING REGIONAL AIR QUALITY CONTROL STRATEGIES
W. T. Mikolowsky, J. H. Bigelow, B. F. Goeller, and J. K. Ives Dec. 1973 76 p refs Sponsored by San Diego County and EPA
(R-1367-SD/Append-5) Avail: NTIS HC $7.00

The computer-based tradeoff model was developed to evaluate alternative strategies for meeting regional air quality standards, select minimum total cost strategies, and analyze the sensitivity of the results to key assumptions. The tradeoff model searches for the best combination, defined as the one that meets the desired air-quality standard for the minimum value of the objectives function, where the function includes both the net expenditure for strategy components, and the monetary proxy for the social cost of forgone travel. It also calculates a variety of environmental, transportation service, economic, and distributional impacts. Air quality control strategies are considered to consist of three primary components: (1) fixed-source controls (including aircraft), (2) retrofit control devices and inspection/maintenance policies for in-use vehicles, and (3) transportation management controls. Tradeoff incorporates the policy-oriented transportation model as a sub-routine and uses it to estimate effects on the transportation management controls. These controls include bus system improvements, vehicle mileage surcharge (added gas tax) or limitation (rationing), induced changes in auto occupancy (carpooling), and induced changes in traffic congestion. The tradeoff model operates in both a strategy-evaluation mode and a strategy-selection mode. Author

N74-31093# RAND Corp., Santa Monica, Calif.
SAN DIEGO CLEAN AIR PROJECT: EXECUTIVE SUMMARY
Bruce F. Goeller et al Dec. 1973 19 p Sponsored by San Diego County and EPA
(R-1362/1-SD) Avail: NTIS HC $4.00

A final summary of the planning stage of the San Diego Clean Air Project is presented which decribes the methodology used to obtain a feasible pollution control program which represents a balanced combination of pure and mixed strategies. A screening process was employed to create models for evaluation and implementation of the following: (1) fixed-source controls (including aircraft); (2) retrofit devices and inspection/maintenance policies for light-duty motor vehicles; and (3) transportation management. Tentative decisions are reported and the problems in planning and implementation of the project are discussed.
Author

N74-31094*# Scientific Translation Service, Santa Barbara, Calif.
THE SIGNIFICANCE OF TURBULENCE MODELS FOR THE CALCULATION OF THE DISPERSION OF BALLISTIC ROCKETS
B. Weissenbach Washington NASA Jul. 1974 13 p Transl. into ENGLISH from Meeting of the DGLR Sci. Comm. on Flight Performance and Flight Characteristics (Darmstadt), 12-13 Nov. 1970, DLR-Mitt-70-12 p 87-97
(Contract NASw-2483)
(NASA-TT-F-15798; DLR-Mitt-70-12) Avail: NTIS HC $4.00 CSCL 04B

A discussion is presented of the influence of turbulence fields

near the ground and at high altitudes on the dispersion of projectiles. The influence of various wind wave lengths are discussed. Author

N74-31095# National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY, JUNE 1974 Key to Meteorological Records Documentation No. 5.4
Jul. 1974 94 p refs
Avail: NTIS HC $7.75

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

N74-31096# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 5, 1974
24 Jul. 1974 212 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 3-126
(JPRS-62559) Avail: NTIS HC $13.75

Articles are presented on microclimate, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, and the activities of the Soviet Hydrometeorological Service. For individual titles, see N74-31097 through N74-31114.

N74-31097 Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF A SYSTEM FOR OBJECTIVE ANALYSIS OF HETEROGENEOUS DATA BASED ON THE METHOD OF OPTIMAL INTERPOLATION AND OPTIMAL AGREEMENT
L. S. Gandin and R. L. Kagan *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 1-11 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 3-10 (For availability see N74-31096 20-20)

The principles are discussed of constructing a system for objective analysis of meteorological fields using information of various types based on the method of optimal interpolation and optimmal matching. It is demonstrated that when constructing such a system, it is important to take into account the properties of the various types of information and the interrelation among them. A study was made of the paths and possibilities of using three sources of information in addition to the ordinary aerological sounding data for the geopotential. These are the wind data, the data from indirect satellite sounding, and the data on numerical forecasting for the investigated point in time. Author

N74-31098 Joint Publications Research Service, Arlington, Va.
A METHOD OF OBJECTIVE ANALYSIS OF METEOROLOGICAL ELEMENT FIELDS ON A SPHERE
V. V. Penenko *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 12-30 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 11-23 (For availability see N74-31096 20-20)

The method of piecewise-polynomial approximation by bicubic polynomials was discussed for the interpolation of meteorological element fields on a sphere from an irregular network of stations to a regular network, and the description of the computation algorithm js given. The interpolation procedure is based on solving the variation problems by iteration methods. Author

N74-31099 Joint Publications Research Service, Arlington, Va.
CONVECTION CONDITIONS IN THE INTRATROPICAL ZONE OF CONVERGENCE OVER THE EASTERN ATLANTIC
N. V. Lebedeva and N. A. Zavelskaya *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 31-46 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 24-33 (For availability see N74-31096 20-20)

For the intratropical zone of convergence by the TROPEX-72 data obtained on the Musson, Passat and Akademik Kurchatov ships, the convection parameters were defined. It was established that the formation of intense showers results primarily from forced convection. The potential instability of the air is estimated, and it is compared with the amount of uplift to the condensation level. The moisture reserve and mean specific humidity in the air column from the ocean surface to the 400 millibar level are defined. Author

N74-31100 Joint Publications Research Service, Arlington, Va.
RELATION BETWEEN THE ALTITUDE OF THE LOWER CLOUD BOUNDARY AND THE METEOROLOGICAL RANGE OF VISIBILITY
V. G. Tsverna *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 47-55 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 34-39 (For availability see N74-31096 20-20)

Based on data from hourly observations in Obninsk, regression analysis was performed on the relation between the altitude of the lower cloud boundary and the meteorological range of visibility. The results of the analysis can be used for the development of complex quantitative forecasts of the altitude of the lower cloud boundary and visibility. For the cold half of the year, a table is presented for the frequency distribution of visibility for various values of the altitude of the lower cloud boundary. Author

N74-31101 Joint Publications Research Service, Arlington, Va.
WINTER OPERATIONS IN ANTARCTICA IN 1973
A. F. Treshnikov *In its* Meteorol. and Hydrol. No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 56-76 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 40-53 (For availability see N74-31096 20-20)

The story of freeing the Diesel electric ship Ob from ice imprisonment, and the winter maritime operations in the vicinity of Mirnyy and Molodezhnaya during the 18th Soviet Antarctic Expedition is discussed. The ice situation at that time in Antarctica is analyzed. Author

N74-31102 Joint Publications Research Service, Arlington, Va.
CRITICAL GRASSHOFF NUMBERS AS A FUNCTION OF THE ELONGATION OF A TWO-DIMENSIONAL BASIN HEATED FROM BELOW **c12**
V. V. Alekseyev and V. Ye. Belashchenko *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 77-89 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 54-63 (For availability see N74-31096 20-20)

By using the variation principle of least effect for a two-dimensional rectangular basin heated from below, a study was made of the critical Grasshoff numbers as a function of the ratio of the basin length to its height and the stationary state number. The amplitude of the current function is found for a basin with a square cross section. Author

N74-31103 Joint Publications Research Service, Arlington, Va.
ALBEDO VALUES FOR THE SNOW AND ICE COVER IN THE LOWER REACHES AND ESTUARIES OF ARCTIC RIVERS
Yu. V. Nalimov and A. A. Timerev *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 90-97 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 64-68 (For availability see N74-31096 20-20)

Data are presented on the reflectivity of the ice at different degrees of disintegration and contamination in the lower reaches and estuaries of Arctic rivers. Author

N74-31104 Joint Publications Research Service, Arlington, Va.
HYDROLOGIC SERVICING OF GEOLOGICAL EXPLORATION ON THE SEA SHELF
A. Ye. Smoldyrev, S. Ye. Saks, and I. Sh. Gezin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 98-105 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 69-73 (For availability see N74-31096 20-20)

The peculiarities of the geological exploration operations on the sea shelf are described. A study is made of the specific nature of hydrologic servicing of these operations. A number of problems are noted which are subject to solution on interaction of the marine geological and hydrometeorological services. Author

N74-31105 Joint Publications Research Service, Arlington, Va.
DETERMINING THE INFORMATION RELATION BETWEEN THE PRESSURE FIELDS OF THE ATMOSPHERE AND THE ICE DRIFT IN THE ARCTIC SEAS (IN THE EXAMPLE OF THE LAPTEV SEA) **c13**

A. I. Murzin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 106-114 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 74-79 (For availability see N74-31096 20-20)

The possibility was studied of applying the entropic relation to determining the optimal scales of atmospheric processes which effect ice drift in the Laptev Sea. Author

N74-31106 Joint Publications Research Service, Arlington, Va.
PROBABILITY CALCULATIONS OF THE DEPTH OF THE SNOW COVER CONSIDERING THE TERRITORIAL NONUNIFORMITY OF OCCURRENCE c13

A. P. Sofiyan and A. I. Mazur *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 115-123 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 80-85 (For availability see N74-31096 20-20)

The calculation is presented for the determination of the snow depth, and the probability of an arbitrary time, from the beginning of formation of the stable snow cover to the maximum snow accumulation. The territorial nonuniformity of its occurrence is shown in nomograms. It is demonstrated that the distribution of the snow cover depth in the general case is subject to gamma distribution. The normalization of the dynamic depth of the snow cover and the time of reckoning its occurrence permit a generalized characteristic of the snow accumulation. Author

N74-31107 Joint Publications Research Service, Arlington, Va.
EFFECT OF LIGHT AND TEMPERATURE DURING THE FALL ON THE WINTERING AND HARVEST OF WINTER CROPS c13

A. I. Korovin and Ye. V. Manayev *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 124-135 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 86-93 (For availability see N74-31096 20-20)

The experimental results of studying the effect of air temperature, and illumination, during the fall, on the wintering and harvest of winter wheat, and winter rye are discussed. Author

N74-31108 Joint Publications Research Service, Arlington, Va.
OSCILLATIONS WITH VAISAELAE FREQUENCY IN A GEOSTROPHIC CURRENT FIELD c13

M. T. Savin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 136-141 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 94-97 (For availability see N74-31096 20-20)

The oscillation of particles was studied in a continuously stratified ocean with a geostrophic current. It was assumed that the oscillations are completed along the normal to the isobaric surfaces. It is demonstrated that in a real ocean the frequency of such oscillations depends not only on the vertical density gradient but also on the horizontal density gradient, and is distinguished from the ordinary Vaisala frequency. Author

N74-31109 Joint Publications Research Service, Arlington, Va.
EFFECT OF AN OIL SLICK ON THE SEA SURFACE ON TURBULENCE AND THE LAYER OF THE ATMOSPHERE NEXT TO THE WATER c13

O. A. Kuznetsov and G. N. Panin *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 142-146 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 97-99 (For availability see N74-31096 20-20)

The results of measuring the spectra of the vertical wind velocity component, the air humidity and the moisture flow above the sea surface covered by an oil slick are compared with the measurements under analogous conditions in the absence of the oil slick. Author

N74-31110 Joint Publications Research Service, Arlington, Va.
CONSTRUCTING A MODEL OF THE OPENING UP OF LARGE RIVERS c13

E. A. Bondarev, A. V. Kolmogorov, and L. I. Fayko *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 147-151 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 99-101 (For availability see N74-31096 20-20)

The results of the observations of the spring rise in the level of the Lena River before opening up are discussed. The possibility of determining the deformation of the ice cover on the basis of the linear viscous elasticity theory is demonstrated. The results of the calculations are in agreement with the observations. Author

N74-31111 Joint Publications Research Service, Arlington, Va.
POWER FORMULAS FOR RIVERBEDS WITH A HIGH DEGREE OF ROUGHNESS c13

A. K. Ryabov *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 152-156 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 102-104 (For availability see N74-31096 20-20)

Functions are proposed for the Chezy coefficient for rivers with a degree of roughness between 0.0275-0.100. The relation between the mean diameter of the alluvial deposits and the roughness coefficient is established. The basis for the study is the hydrologic observations of 130 rivers. Author

N74-31112 Joint Publications Research Service, Arlington, Va.
CALCULATING THE VELOCITY PROFILE OF MUDFLOWS c13

V. I. Yefremov *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 157-164 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 104-107 (For availability see N74-31096 20-20)

A method of calculating the velocity profile of mudflows is obtained based on studies of the structure of the turbulent channel flow taking into account the effect of the specific weight. A comparison is made between the calculated values of the mudflow velocities and the data obtained by natural measurements. Author

N74-31113 Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF AVALANCHE MOVEMENT c13

A. I. Korolev *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 165-168 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 107-108 (For availability see N74-31096 20-30)

A description is presented of some of the peculiarities of movement of a wet avalanche revealed during observations directly near the head of the avalanche. The conclusion is drawn that the friction coefficient of the snow is different in different parts of the avalanche and depends on the size of the avalanche. Author

N74-31114 Joint Publications Research Service, Arlington, Va.
PATHS OF DEVELOPMENT OF AGROMETEOROLOGY AND AGROCLIMATOLOGY

R. A. Konstantinov *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 169-178 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 109-113 (For availability see N74-31096 20-20)

The state-of-the-art of research in the field of agrometeorology and agroclimatology is described, and the causes inhibiting the development of this science are explained. A study was made of the general prospects for the development of agrometeorology and specific goals facing agroclimatology. A basis is provided for considering soil fertility when defining agroclimatic districts, that is, the necessity for evaluating the climatic soil resources of the harvest. Author

N74-31115*# Cleveland State Univ., Ohio.
DEVELOPMENT OF A GLOBAL POLLUTION MODEL FOR CO, CH4, AND CH2O Final Report, 1 May - 14 Aug. 1974
Leonard K. Peters 14 Aug. 1974 16 p refs
(Grant NSG-1030)
(NASA-CR-139484) Avail: NTIS HC $4.00 CSCL 04A

The current status of a global pollution model for carbon monoxide, methane, and formaldehyde is described. The physico-chemical action is considered of these three pollutants in the troposphere. This geographic restriction is convenient since the tropopause provides a natural boundary across which little transport occurs. The data on sources and sinks for these pollutants is based on available information and assumptions relative to the major man-made and natural contributions. The distributions and concentrations of methane, formaldehyde, and carbon monoxide in the atmosphere are interrelated by the chemical

reactions in which they participate. A chemical kinetic model based on the pseudo-steady state approximation for the intermediate species was developed to account for these reactions. The numerical procedure used to mathematically describe the pollution transport is a mass conservative scheme employing an integral flux approach. Author

N74-31116# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
ATMOSPHERIC TRANSPORT AND DISPERSION OF POLLUTANTS AND RELATED METEOROLOGICAL STUDIES
Annual Progress Report, Jul. 1971 - Jun. 1972
R. J. List, ed. Mar. 1973 53 p refs
(NOAA-TM-ERL-ARL-40) Avail: NTIS HC $4.75

Predictions of future and past carbon dioxide concentrations were derived from a simple multireservoir exchange model: stratosphere, troposphere; mixed layer of the ocean, deep ocean; short-term land biosphere, long-term land biosphere, and marine biosphere. All exchanges are prescribed from literature or personal estimates except the troposphere-mixed ocean layer, which is obtained from a trail-and-error procedure using bomb C-14O2 as a tracer. Estimates of the global distribution of carbon monoxide ozone, and methane were derived by trail-and-error modeling from data on steady-state concentrations, atmospheric motions, sources, and sinks. Some of the reasons for the uncertainties in the method are disucssed. Data on hourly deposition rates of local fallout from underground cratering nuclear explosions were analyzed to provide modeling data on the amount and distribution of radioactivity in the initial cloud for this type of event. Computerized trajectory programs developed to calculate the trajectories of particles released at the Nevada Test Site are discussed. NSA

N74-31117# Oak Ridge National Lab., Tenn.
VARIATIONS IN ATMOSPHERIC AEROSOLS AS A FUNCTION OF THE PROPERTIES OF THE MEDIUM
N. Dupoux Jul. 1973 27 p refs Transl. into ENGLISH from CEA (Saclay), CEA Report No. CEA-R-4461 27 p Sponsored by AEC
(ORNL-TR-2761) Avail: NTIS HC $3.50

Electrically neutral particles of small dimensions which appear in the air during the day and then disappear by coagulation and fixation on the preexisting paritcles were studied. The degree of pollution of the region affects the aerosol concentration and the rapidity of its development. Fluctuations in the properties of atmospheric particulates coincide with those of SO2 content. The demonstration in air of substances that come from this gas emphasizes its role in atmospheric pollution. Some meteorological parameters affect the behavior of the atmospheric aerosol. Rain washes the atmosphere. Fog absorbs the SO2 in the droplets, and in its presence the aerosol is made up of large particles. Temperature inversions accompanied by calm favor concentration of the pollutants. A relation between the appearance of small nuclei in the air and the simultaneous presence of SO2 and solar radiation exists. Author (NSA)

N74-31118# National Climatic Center, Asheville, N.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS, WESTERN EUROPEAN COASTAL MARINE AREAS. VOLUME 6: AREA 31; OSLO, AREA 32; COPENHAGEN, AREA 33; BORNHOLM IS, AREA 34; GULF OF DANZIG, AREA 35; STOCKHOLM, AREA 36; GULF OF RIGA
Jan. 1974 484 p refs Sponsored by Naval Weather Service Command, Washington, D.C.
(AD-777049) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data family 11 (TDF-11), marine surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. Areas discussed include Oslo, Norway; Copenhagen, Denmark; Stockholm; Sweden; Bornholm Is.; the Gulf of Danzig and the Gulf of Riga. GRA

N74-31119# National Environmental Research Center, Research Triangle Park, N.C.
[RESEARCH PROGRESS IN AIR POLLUTION, RADIATION, AND PESTICIDES AFFECTING COMMUNITY HEALTH]
Annual Report, 1972
Jun. 1973 84 p refs
(PB-230085/3) Avail: NTIS HC $7.25 CSCL 13B

The purpose is to introduce the National Environmental Research Center in Triangle Park, North Carolina to people interested in a clearer environment and to present the history, organization, accomplishments, current endeavors, and general goals. Individual laboratories, detailing the overall mission and organization of each are examined. Highlights of major accomplishments and future research emphasis are pointed out. GRA

N74-31120# Denver Research Inst., Colo.
KINETIC STUDIES OF ICE CRYSTAL GROWTH, VOLUME 1 Final Report
Norihiko Fukuta, Young H. Paik, V. K. Saxena, James Armstrong, and Arpad Gorove Aug. 1973 131 p refs
(Grants NSF GI-34026; NSF GA-29525)
(PB-229790/1; DRI-2627; NSF-RA/E-73-011) Avail: NTIS HC $9.75 CSCL 04B

Contents: Measurement of deposition coefficient of water vapor on ice; kinetics of ice crystal growth from the vapor; kinetic threshold conditions for fog formation in cloud chambers and marine environment; a hypothesis of hurricane modification by cloud seeding; and development and testing of a supercooled cloud tunnel. GRA

N74-31121# Ocean Data Systems, Inc., Rockville, Md.
SURVEY OF PACIFIC THEATRE SATELLITE DATA USERS Final Report, Dec. 1973 - Apr. 74
William E. Hubert 18 Apr. 1974 102 p refs
(Contract N66314-74-C-1266)
(AD-780423; ODSI-670; EPRF-TR-3-74(ODSI)) Avail: NTIS CSCL 04/2

Results of a survey of Pacific theatre users of satellite data to obtain input to the Satellite Data Processing System (SATDAT) are reported. These results will support the planning of Naval Air Systems Command and Naval Weather Service for satellite data processing and applications, satellite imagery and derived product development, communications requirements, and display device development. It is shown that a need exists for the use of satellite data to improve atmospheric analysis and prediction. Author (GRA)

N74-31122# Naval Electronics Lab. Center, San Diego, Calif.
ATMOSPHERIC STRUCTURE OBSERVED BY FM-CW RADAR AT THE SALTON SEA IN THE CALIFORNIA DESERT Research and Development Report, Aug. 1972 - Jul. 1973
D. R. Jensen, V. R. Noonkester, and J. H. Richter 11 Mar. 1974 33 p refs
(XR02101001; NELC Proj. M103)
(AD-780427; NELC-TR-1915) Avail: NTIS CSCL 04/2

The observational results of a scanning mobile FM-CW radar sounder, operated in an arid environment at the Salton Sea Navy Base, California, for a period of five days, are reported. The returns are compared with returns taken with a fixed (vertically pointing) FM-CW radar sounder operating in a marine environment in San Diego, California. Echoes obtained at Salton Sea were found to be predominately low-level, surface-based, convective-like structures apparently resulting from vertical mixing induced by daytime surface heating. Relatively few elevated layers were observed during the short measurement period in the arid environment as compared to observations in San Diego. Waves resembling K-H instabilities were observed. Insect flight patterns were found to be influenced by atmospheric structure and may be used as tracers for vertical atmospheric motion. Multiple layering showing wave motions was also observed and is common to both environments. These radar findings were supported by simultaneous radiosondes. Author (GRA)

N74-31123# Army Electronics Command, Fort Monmouth, N.J.
A HIGH RESOLUTION TEMPERATURE SONDE FOR THE LOWER ATMOSPHERE
Ricardo Pena and Harry N. Schwartz May 1974 24 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-780084; ECOM-5541) Avail: NTIS CSCL 04/2

The paper describes a High Resolution Temperature Sonde (HRTS), developed by the Atmospheric Sciences Laboratory (ASL), and compares lower atmospheric temperature profiles measured

by the HRTS to the same profiles measured by the standard radiosonde. Data from solid-state, light-weight HRTS's flown on Jimsphere balloons and tracked by a T-9 radar to provide altitude information, are discussed. Instrumentation associated with and calibration related to the HRTS are described. (Modified author abstract) GRA

N74-31124# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USING CLOUD AND TEMPERATURE DATA TO SOLVE PROBLEMS OF RECONSTRUCTING METEOROLOGICAL ELEMENT FIELDS FROM THE DATA OF ARTIFICIAL EARTH SATELLITES
Sh. A. Musaelyan 24 May 1974 12 p refs Transl. into ENGLISH from Tr. Gidrometeorologicheskii Nauch.-Issled. Tsentr SSSR (USSR), no. 104, 1972 p 73-78
(FTD Proj. T74-01-20)
(AD-780370; FTD-HT-23-1115-74) Avail: NTIS CSCL 08/5
The article concerns determining the geopotential field from data on vertical velocities and temperatures. GRA

N74-31125# Edaw, Inc., San Francisco, Calif.
CLIMATIC DATA OF THE LLANO TEXAS REGION: PROJECT SANGUINE
Nov. 1973 19 p Sponsored by Naval Facilities Engineering Command
(AD-780282) Avail: NTIS CSCL 04/2
The purpose of this site study is to assist in determining the most appropriate location of the system within a specified geographical area considering both the optimum cost of system installation and the maximum environmental compatibility. The specific area studied is approximately 2400 square miles in area amd is located about 60-80 miles west-northwest of the city of Austin, Texas. The area includes all or portions of the following Texas counties: Llano, Mason, San saba, McCullough, Gillespie, Blanco, and Burnet. GRA

N74-31126# Air Weather Service, Scott AFB, Ill.
AIR WEATHER SERVICE WEATHER MODIFICATION PROGRAM (FY 1973) Annual Survey Report No. 6
Henry A. Chary, Ted S. Cress, Ronald L. Lininger, and Klaus M. Weickmann Oct. 1973 28 p refs
(AD-7709281; AWS-TR-73-251) Avail: NTIS HC $3.00 CSCL 04/2
The annual report of the weather modification activities of the Air Weather Service covers the projects, their operations and results, accomplished during FY 73. Its primary purpose is to inform AWS field personnel of the direction and progress in weather modification made during the year. Details of the projects are only briefly discussed as such details are published elsewhere, if warranted. The following projects are discussed in the text: cold draft, cold flake, cold clear, cold sight, and cold deck. An operational endeavor at Fairchild AFB is also mentioned.
Author (GRA)

N74-31127# Transportation Systems Center, Cambridge, Mass.
THE TRANSPORTATION AIR POLLUTION STUDIES (TAPS) SYSTEM Interim Report, Jun. 1972 - May 1973
David S. Prerau and Paul J. Downey Mar. 1974 123 p ref
(PB-230919/3; DOT-TSC-OST-73-24) Avail: NTIS HC $4.50 CSCL 13B
The transportation air pollution studies (TAPS) data base and the software system which was developed in association with it are described. The TAPS data base will be used to store the transportation air pollution data (including emissions, meteorological and other data) which are required for the TSC model validation program. The TAPS system is a package of computer programs for storing, manipulating and retrieving data. The system also contains routines for analyzing the performance of dispersion models as well as programs to generate both tabular and graphical output. Users guides for both the storage and retrieval programs of the TAPS system are included as well as examples of how these programs might be used. GRA

N74-31128# Mitre Corp., McLean, Va.
FIXED VS. VARIABLE ENVIRONMENTAL STANDARDS Interim Report
Robert P. Pikul May 1973 44 p refs
(Contract EPA-68-01-1849)
(PB-221878/2; M73-53) Avail: NTIS CSCL 13B
The established nature and enforcement of environmental standards will have a far reaching impact on future socio-economic-environmental characteristics of geographical areas, availability and cost of energy, revitalization of urban areas and overall quality of life. The purpose of the paper is to provide a frame of reference for discussion of fixed vs. variable standards and to generally explore some potential social and economic consequences of allowing variable standards. It is shown that effluent or emission standards particularly, exhibit both fixed as well as variable properties based on parameters such as time, geographical area and source category. Present variability in standards generally results from independent analyses of individual pollutants and individual source categories. The implications of variable standards are discussed within the context of the air pollution problem as a specific illustration. Author (GRA)

N74-31129# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
EVALUATION OF GM 1976 PROTOTYPE VEHICLE, A CATALYTIC EXHAUST MANIFOLD SYSTEM
Henry L. Gompf Jun. 1972 10 p
(PB-218686/4; APTD-1409) Avail: NTIS HC $3.00 CSCL 13B
A test sequence was conducted on a General Motors prototype using a catalytic exhaust manifold system concept. Due to the consistent success displayed by this system in meeting the required 1976 emission level in the General Motors laboratory, an evaluation program was initiated. Beyond necessary engine modifications, a vehicle was equipped with four major emission controls: (1) A quick heat intake manifold, EFE, to assist in cold start fuel evaporation; (2) a Grace noble metal catalyst for oxidation of hydrocarbon and carbon monoxide; (3) a Gulf noble metal catalyst for reduction of oxides of nitrogen; and (4) an air pump and associated valving to supply air for exhaust port oxidation and oxidizing air to the Grace catalyst bed. The GM prototype system was tested three times from a cold start using the 1975 Federal emission test procedure. It appears that this prototype system is an excellent candidate for extended mileage evaluation. GRA

N74-31130# Texas Univ., El Paso. Schellenger Research Lab.
ANALYSIS OF DATA IN SUPPORT OF PROJECT SABAR (BLNS) Final Report, 1 Apr. 1971 - 31 Mar. 1973
Robert Acosta and Kathy Hampson 18 May 1973 28 p
(Contract F19628-71-C-160; AF Proj. 7621)
(AD-780298; AFCRL-TR-73-0296) Avail: NTIS CSCL 04/2
The objective of the contract was to provide computational and analytical services in conjunction with studies concerning the feasibility of flight trajectories. Post-flight analyses of stratospheric balloon programs consisted of transcribing, analyzing, graphing, and providing mathematical computations from graphical data furnished by the Government. During the span of the Contract, eighteen studies were assigned numbered 68 through 85. Author (GRA)

N74-31131# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13401 HONEST JOHN MISSILE NO. 1765, ROUND NO. 641 RML (26 MARCH 1974) Meteorological Data Report
Mar. 1974 23 p
(DA Proj. 1T6-65702-D-127)
(AD-779379; DR-823) Avail: NTIS CSCL 04/2
Meteorological data gathered for the launching of 13401 Honest John, Missile Number 1765, Round Number 641 RML are presented in tabular form. Author (GRA)

N74-31132# National Climatic Center, Asheville, N.C.
U. S. NAVAL WEATHER SERVICE COMMAND SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: EAST AFRICAN AND SELECTED ISLAND COASTAL MARINE AREAS. VOLUME 1: AREA 1, KURIA MURIA ISLANDS; AREA 2, WEST ARABIAN SEA; AREA 3, QAMR BAY; AREA 4, SOCOTRA ISLAND; AREA 5, GULF OF ADEN, NE, AREA 6, GULF OF ADEN, NW

Jun. 1974 484 p
(AD-780313) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N74-31133# National Climatic Center, Asheville, N.C.
U. S. NAVAL WEATHER SERVICE COMMAND SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: EAST AFRICAN AND SELECTED ISLAND COASTAL MARINE AREAS. VOLUME 3: AREA 13, GULF OF ADEN, SW; AREA 14, GULF OF ADEN, SE; AREA 15, SOMALI COAST, NE; AREA 16, SOMALI COAST EAST; AREA 17, SOMALI COAST SE; AREA 18, SOMALI COAST SOUTH
Jun. 1974 486 p
(AD-780314) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from Tape Data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N74-30803* Wisconsin Univ., Milwaukee. Coll. of Engineering and Applied Science.
THE USE OF ERTS-1 IMAGERY IN AIR POLLUTION AND MESOMETEOROLOGICAL STUDIES AROUND THE GREAT LAKES
Walter A. Lyons and Richard A. Northouse *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1491-1504 refs Sponsored in part by NASA (For availability see N74-30774 20-13)
(Grants EPA-R800873; NSF GA-32208)
(Paper-E1) CSCL 04B

N74-30804* Science Applications, Inc., La Jolla, Calif.
A METHOD TO MEASURE THE ATMOSPHERIC AEROSOL CONTENT USING ERTS-1 DATA
Michael Griggs *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1505-1517 refs (For availability see N74-30774 20-13)
(Paper-E2) CSCL 04B

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-31134 British Library Lending Div., Boston Spa (England).
THOUGHTS ON METEOROLOGICAL NAVIGATION
P. DeLaCochetiere [1974] 12 p Transl. into ENGLISH from Navigation (Paris), 1973 p 232-238 In ENGLISH and FRENCH
(BLL-M-23346-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Meteorological influences on marine navigation are discussed in general terms of accomplishing the voyage in optimum conditions of economy, safety, and comfort. F.O.S.

N74-31135 California Univ., Los Angeles.
ON THE USE OF A SIMPLE STELLAR SIGHTER TO DETERMINE BOOSTER NAVIGATION ERROR PARAMETERS Ph.D. Thesis
Jeffrey Michael Nash 1974 140 p
Avail: Univ. Microfilms Order No. 74-18794

The large-scale application of linear estimation theory to a classically unobservable stellar sighter used for augmentation of boost navigation equipment is examined. Relevant results and conclusions applicable to the boost problem are given. In addition, the general nature of optimal constant parameter estimation problems is studied. Two estimation algorithms with functionally-related criterion functions are discussed in terms of their effects and applicability. The fundamental unobservability of a one-star sighter is analyzed and, in terms of initial misalignment errors and drift rate inducing parameters, an optimal star location is analytically identified for estimation observation. It is additionally observed that under appropriate conditions a general, classically unobservable, constant-parameter estimation problem possesses properties which permit reduction in the uncertainty inherent to the unobservable elements. Dissert. Abstr.

N74-31136 Ohio State Univ., Columbus.
ATTITUDE DETERMINATION OF A SPINNING SPACECRAFT THROUGH APPLICATION OF DETECTED AND IDENTIFIED STAR TRANSITS TO THE ESTIMATION OF SPACECRAFT MODEL PARAMETERS Ph.D. Thesis
Thomas Michael Walsh 1974 293 p
Avail: Univ. Microfilms Order No. 74-17815

Techniques and design methods are developed suitable for attitude determination of a spinning spacecraft through the application of estimation procedures, given an assumed dynamical model of the spacecraft, to the times of sightings of stars as observed in a sensor reference frame attached to the spacecraft. The research also covers design considerations of the star mapping instrument, including a discussion of advantages of the application of optical coding techniques to the detection of star signals and enhancement of discrimination of stars brighter than a limiting visual magnitude against the background of dimmer stars. A parameter estimation procedure based on a weighted least square method is developed along with a criterion for goodness of estimates using as a basis the relationship between star sighting time measurement errors and residuals of the estimation procedure. The study also includes a discussion of observability of the selected system states, conditions of singularity or near singularities of the estimator covariance matrix, and techniques for computation of initial state estimates used to initialize the estimator process. Dissert. Abstr.

N74-31137*# Linguistic Systems, Inc., Cambridge, Mass.
POSSIBILITIES OF IMPROVING CONVENTIONAL INSTRUMENT LANDING SYSTEM (ILS)
H. Fricke Washington NASA Aug. 1974 20 p Transl. into ENGLISH from the DGLR-DGON Symp. on New Approach and Landing Techniques (Dusseldorf), 2-4 May 1973, DGLR-Paper-73-017 16 p
(Contract NASw-2482)
(NASA-TT-F-15609; DGLR-Paper-73-017) Avail: NTIS HC $4.00 CSCL 01E

The possibility of improving conventional instrument landing systems by supressing interference from reflected radiation is discussed. The two methods considered are the analysis of interference by additional amplitude and frequency modulation, and the exclusion of interference by quotient formation or circular polarization. Author

N74-31138# Hughes Aircraft Co., Culver City, Calif. Display Systems and Human Factors Dept.
DESIGN CRITERIA FOR AIRBORNE MAP DISPLAYS. VOLUME 1: METHODOLOGY AND RESEARCH RESULTS Final Report
W. L. Carel, J. J. McGrath (Anacapa Sciences, Inc.), M. L. Hershberger, and J. A. Herman Mar. 1974 480 p refs
(Contract N00014-71-C-0070; NR Proj. 213-075)
(AD-779851; HAC-Ref-C2151-003-Vol-1; JANAIR-731101-Vol-1) Avail: NTIS CSCL 17/7

The work accomplished under the contract is reported in two volumes. Volume I describes the methods used to develop the design criteria and the results of the surveys, analyses, and experimental research conducted in the course of the program. The research is categorized under the following headings: (1) mission requirements analysis, (2) the legibility problem, (3) a survey of contemporary map displays, (4) a survey of users of operational map displays, and (5) a survey of contemporary cartographic support systems. (Modified author abstract) GRA

N74-31139# Hughes Aircraft Co., Culver City, Calif. Display Systems and Human Factors Dept.
DESIGN CRITERIA FOR AIRBORNE MAP DISPLAYS. VOLUME 2: DESIGN CRITERIA Final Report
W. L. Carel, M. L. Hershberger, J. A. Herman, and J. J. McGrath

(Anacapa Sciences, Inc.) Mar. 1974 180 p refs
(Contract N00014-71-C-0070; NR Proj. 213-075)
(AD-779852; HAC-Ref-C2151-003-Vol-2;
JANAIR-731101-Vol-2) Avail: NTIS CSCL 17/7

This is the final report of research conducted under ONR contract N00014-71-C-0070, NR 213-075 entitled Development of Design Criteria for Projected Map Displays. Volume 2 consists of the statement of the design criteria. The criteria described are grouped under two main headings: (1) The Displayed Map Image and (2) Other Design Issues. Criteria appropriate to the displayed map image were developed from operational requirements and from legibility requirements. Criteria appropriate to other design issues deal with features of map displays that are not directly related to the displayed map image; i.e., operating modes, controls, updating, and the like. GRA

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-31140 British Library Lending Div., Boston Spa (England).
GENERAL PROBLEMS OF FRETTING CORROSION: PARTICULAR APPLICATIONS IN THE FAST REACTORS DEVELOPED AT THE CSN, CASACCIA
G. Brunori, U. Farinelli, and G. Tomassetti [1974] 40 p refs Transl. into ENGLISH from the Italian report Presented at the 1st Natl. Conf. on Tribology, San Donato Milanese, 11-13 Jun. 1973
(BLL-Risley-TR-2750-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Theories of Fretting Corrosion (FC) are reviewed, and the appearance of a fretted surface is described as a mixture of oxide and metal. The effects of FC on fatigue strength is examined along with the mechanism of FC. The FC in fast reactors is analyzed. F.O.S.

N74-31141# Oak Ridge National Lab., Tenn.
ORNL ISOTOPIC POWER FUELS Quarterly Report, period ending 31 Dec. 1973
E. Lamb Feb. 1974 36 p refs
(Contract W-7405-eng-26)
(ORNL-4939) Avail: NTIS HC $4.00

Progress is reported on ORNAL isotopes power fuels research. Data cover: (1) heat soak periods for 49 couples of the compatibility matrix, (2) short term ceramic compatibility matrix exposures, (3) fabrication techniques for preparation of an 11 couple compatibility matrix, and (4) free energy calculations of Cm2O3 fuel reactions with Haynes 188, Ta-10% W, TZM alloys, and Be. Reports were also made on the release characteristics of hot pressed (Cm-188)O3 vapor pressure determination of Cm metal from 900 to 1800 C. X-ray diffraction analysis of materials resulting from exposure of (Cm-244)O3 to following sea water, boiling sea water, and dry air, and potential criticality problems in Cm-244 assemblies. Author (NSA)

N74-31142# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
GEOMETRICAL EFFICIENCY FOR THE TRIGGERED HIGH PRESSURE STREAMER CHAMBER OF THE JINR
M. Albu, T. Besliu, I. V. Falomkin, C. Georgescu, A. Mihul, and Yu. A. Shcherbakov 1973 12 p refs
(JINR-E1-7567) Avail: AEC Depository Libraries HC $3.00

Using various methods, the geometric efficiency for the triggered high-pressure streamer chamber of the JINR is calculated. Author (NSA)

N74-31143# Mound Lab., Miamisburg, Ohio.
GUIDE TO THE ACCEPTANCE CRITERIA FOR RADIOISOTOPIC HEAT SOURCES
D. L. Coffey 20 Feb. 1974 6 p ref
(Contract AT(33-1)-GEN-53)
(MLM-2116) Avail: NTIS HC $3.00

During the development phases of heat source programs (the fabrication for design verification, engineering evaluation, etc.), heat sources and test capsules are ofter required prior to the formalization of specifications and drawings. Furthermore, there are also programs where the quantities and technology are such that a detailed and unique set of documentation is not justified. Consequently, this document is intended to be a general guide to the criteria applicable in evaluating the acceptability of radioisotopic heat sources and test sources when thay are produced under these circumstances. The guidelines are general in nature, since many applications of heat sources have unique requirements, but typical values are given where practicable. NSA

N74-31144# Los Alamos Scientific Lab., N.Mex.
DATA SHEETS FOR PPO RADIOISOTOPIC FUEL
T. K. Keenan, R. A. Kent, R. N. R. Mulford, and M. W. Shupe Dec. 1973 12 p refs
(Contract W-7405-eng-36)
(LA-5160-MS(Rev-1)) Avail: NTIS HC $4.00

The thermal energy of PPO (pure plutonium oxide) fuel results from the radioactive decay of Pu - 238 and this energy is converted into usable electric power for space probe or other applications. The basic fuel module associated with the current MHW heat source is a PPO sphere 1.465 + or - 0.015 in. in dia and containing 100 + or - 2 thermal watts. The spheres are individually encapsulated and then assembled into geometric arrays to form the working heat source. Certain properties of PuO2 with emphasis on behavior at the proposed operational conditions being discussed are listed. Author (NSA)

N74-31145# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN STUDIES OF MIRROR MACHINE REACTORS
R. W. Werner, G. A. Carlson, J. Hovingh, J. D. Lee, and M. A. Peterson 7 Dec. 1973 12 p refs Submitted for publication Sponsored by AEC
(UCRL-75249) Avail: NTIS HC $3.00

An overview is presented of a mirror fusion reactor design study. The general methodology used in the study is discussed, the reactor is described, and some design alternatives to the present approach are enumerated. The system chosen for this design study is a mirror machine with direct conversion using D-T fuel. The nominal power output is 200 MW. The coil geometry is the Yin Yang, minimum with a vacuum mirror ratio of 3. The coil is of particular utility because of its simple conductor shapes and because the two separate conductors, by proper B-field biasing, allow the charged particles to escape preferentially through one mirror only and through a relatively small window of that mirror. This is necessary for direct converter economy. Author (NSA)

N74-31146# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
AERIAL RADIOLOGICAL MEASURING SYSTEM (ARMS): SYSTEMS AND PROCEDURES EMPLOYED THROUGH FY71
16 Aug. 1973 82 p refs
(Contract AT(29-1)-1183)
(EGG-1183-1526; L-1038) Avail: NTIS HC $6.25

The Aerial Radiological Measuring System (ARMS) is described.Designed to rapidly survey large terrestrial surface areas for low level background radiation, the ARMS has also proven extremely useful in locating lost radioactive sources of relatively low activity. The system consists of sodium scintillation detectors, data processing electronics, Doppler radar positioning equipment, meteorological instruments, recording equipment, and direct readout hardware. The instrumentation, operational procedures, and data reduction techniques are described, together with their applications and sample results. Author (NSA)

N74-31147# Academia R. P. R., Bucharest. Inst. de Fizica Atomica.
QUESTION ABOUT THE FEASIBILITY OF AN ALTERNATING NUCLEAR ENGINE
G. Cristea 1973 16 p refs
(IFA-FR-115-1973) Avail: AEC Depository Libraries HC $3.00

The possibility is discussed of the direct transformation of

nuclear energy into mechanical energy through the agency of an alternating heat engine. Author (NSA)

N74-31158 National Bureau of Standards, Boulder, Colo.
THE PHYSICAL BASIS OF ATOMIC FREQUENCY STANDARDS
Allan S. Risley *In its* Time and Freq. May 1974 p 65-84 refs (For availability see N74-31155 20-23)
(NBS-TN-399)

N74-31159 National Bureau of Standards, Boulder, Colo.
A HISTORICAL REVIEW OF ATOMIC FREQUENCY STANDARDS, PART A. RECENT PROGRESS ON ATOMIC FREQUENCY STANDARDS, PART B
Roger E. Beehler *In its* Time and Freq. May 1974 p 85-109 refs (For availability see N74-31155 20-23)

N74-31164 National Bureau of Standards, Boulder, Colo.
THE NATIONAL BUREAU OF STANDARDS ATOMIC TIME SCALE: GENERATION, STABILITY, ACCURACY AND ACCESSIBILITY
David W. Allan, James E. Gray, and Howard E. Machlan *In its* Time and Freq. May 1974 p 205-231 refs (For availability see N74-31155 20-23)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-31148* National Aeronautics and Space Administration. Pasadena Office, Calif.
DIGITAL SERVO CONTROL OF RANDOM SOUND TEST EXCITATION Patent
Robert B. Nakich, inventor (to NASA) (JPL) Issued 6 Aug. 1974 14 p Filed 16 Mar. 1972 Supersedes N72-25628 (10 - 16, p 2183) Sponsored by NASA
(NASA-Case-NPO-11623-1; US-Patent-3,827,288; US-Patent-Appl-SN-235338; US-Patent-Class-73-69; US-Patent-Class-73-71.5R; US-Patent-Class-181.5R) Avail: US Patent Office CSCL 20A

A digital servocontrol system for random noise excitation of a test object in a reverberant acoustic chamber employs a plurality of sensors spaced in the sound field to produce signals in separate channels which are decorrelated and averaged. The average signal is divided into a plurality of adjacent frequency bands cyclically sampled by a time division multiplex system, converted into digital form, and compared to a predetermined spectrum value stored in digital form. The results of the comparisons are used to control a time-shared up-down counter to develop gain control signals for the respective frequency bands in the spectrum of random sound energy picked up by the microphones.
Official Gazette of the U.S. Patent Office

N74-31149 British Library Lending Div., Boston Spa (England).
THE STABILITY OF AN AZIMUTHAL FLOW SET-UP BY A ROTATING MAGNETIC FIELD
A. B. Kapusta, V. V. Dremov, and E. S. Bartoshuk 4 Mar. 1974 8 p refs Transl. into ENGLISH from Magn. Hydrodynamics (USSR), no. 4, 1971 p 31-35
(BLL-CE-Trans-6314-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl: 1 BLL Photocopy coupon

The magnetohydrodynamic stability was investigated of an azimuthal dissipative flow which consisted of an incompressible electrically conducting liquid in an infinitely long tube of circular cross section, and was generated by a rotating homogenous magnetic field of the form H sub o esp i (omega t - phi), and whose axis of rotation coincided with the axis of symmetry of the tube. A system of magnet hydrodynamic equations, averaged over phi, which describes the axisymmetric rotation of the liquid with an inductionless approximation, was also studied using a method of linear perturbations to determine the stability of the primary steady-state flow. It was established that the secondary steady-state flow occurs in the form of a double vortex layer.
Author

N74-31150 Cornell Univ., Ithaca, N.Y.
DESIGN OF A SEGMENTED PRIMARY MIRROR FOR AN ORBITING TELESCOPE Ph.D. Thesis
John Andrew Dalessandro 1974 109 p
Avail: Univ. Microfilms Order No. 74-17095

The development of a design procedure to determine the optimum segmented configuration for the primary mirror of the Large Space Telescope is discussed. The primary mirror is modeled as a solid, constant thickness, thin flat plate of 120in. outside diameter and 40in. inside diameter. The mirror is assumed to be cut into either annular segments or sectors of annular segments. Two nonuniform, in-plane temperature distributions are assumed. A computer program is developed using sector shaped finite elements to calculate the thermoelastic displacements in each of the mirror segments assuming plane stress. Given these displacements, the optimum position for each segment is determined and the rms deviation from a best-fit paraboloid is calculated. An approximate solution which assumes Poission's ratio equal to zero is prv fosed and is shown to be sufficiently accurate for design purposes. Dissert. Abstr.

N74-31151 Minnesota Univ., Minneapolis.
A STUDY OF THE NONLINEAR OPTICAL PROPERTIES OF PROUSTITE Ph.D. Thesis
Gary Wayne Bickel 1974 114 p
Avail: Univ. Microfilms Order No. 74-17230

The dispersion of the nonlinear coefficients of Proustite were studied both theoretically and experimentally. Second harmonic generation was used to measure the nonlinear coefficients for 34 frequencies of the carbon dioxide laser. The measurements indicate some dispersion in the coefficients due to lattice resonance contributions at lower frequencies. Two crystal geometries were used for additive and opposing contributions in the piezoelectric notation. Interference effects at both the fundamental and second harmonic frequencies were observed in second harmonic generation. These were due to high Fresnel reflections in the uncoated crystals and complicated the data analysis. At the fundamental frequency the interference effect was used to make new measurements of the absorption coefficent for ordinary polarization. Dissert. Abstr.

N74-31152# Ruhr Univ., Bochum (West Germany).
EFFECT OF THE TECHNOLOGICAL GRINDING PROCESS ON THE COERCIVE FIELD OF (LANTHANIDE) Co5 PERMANENT MAGNETIC MATERIAL Ph.D. Thesis [EFFEKT DES TECHNOLOGISCHEN MAHLPROZESSES AUF DAS KOERZITIVFELD VON (LANTHANID) Co5 DAUERMAGNET-MATERIAL]
Manfred Paulus 1973 114 p refs In GERMAN
Avail: NTIS HC $8.75

Grinding of lanthanide Co5 materials reduces the coercive field to about 1% of its theoretical highest value. This anomalous behavior is attributed to a lowering of the chemical lanthanite composition by oxidation at the grain surface, and to save destruction of the crystal structure through stacking faults that develop during plastic deformation. Transl. by G.G.

N74-31153# Technische Universitaet, Brunswick (West Germany).
IMPULSE TRANSFER IN MULTIWAVE OPTICAL WAVEGUIDE FIBERS Ph.D. Thesis [IMPULSUEBERTRAGUNG IN VIELWELLIGEN LICHTLEITFASERN]
Hans-Joachim Heyke 1973 78 p refs In GERMAN
Avail: NTIS HC $7.00

A mathematical model is developed for the optical impulse transfer properties of dielectric fibers coupled to a phase locked helium neon laser signal. Input and output signals are used to formulate analytical expressions for wave propagation constants and differential propagation times, for the coupling coefficients, and for eigenwave couplings caused by boundary layer disturbances between fiber nucleus and fiber envelope. Also calculated are eigenwave excitations in fibers caused by electric field distributions. Transl. by G.G.

N74-31154*# Saad (Geti), Karachi (Pakistan).
ANALYTICAL MECHANICS OF SYSTEMS WITH VARIABLE MASS
V. S. Novoselov Washington NASA Aug. 1974 424 p refs Transl. into ENGLISH of the book "Analiticheskaya Mekhanika Sistem s Peremennymi Massami" Leningrad, Leningrad State Univ., 1969 p 1-240 Sponsored in part by NASA
(Contract NSF C-505)
(NASA-TT-F-15908) Avail: NTIS HC $24.25 CSCL 20K

The basic analytical methods for mechanical systems with variable mass are presented along with demonstrations of those methods to concrete problems. Consideration is afforded to questions of the motion of a point in the central field and the motion of gyroscopic systems and vehicles with variable mass. The text is suited primarily for students with an interest in rocket dynamics and celestial ballistics. Author

N74-31155# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
TIME AND FREQUENCY: THEORY AND FUNDAMENTALS
Byron E. Blair, ed. May 1974 470 p refs
(NBS-Mono-140; LC-73-600299) Avail: SOD HC $8.65 as C13.44:140

A monograph is developed which describes various aspects of time and frequency. The subjects discussed are: (1) elemental concepts of precise time and frequency; (2) basic principles of quartz oscillators and atomic frequency standards; (3) current status of atomic frequency standards; (4) areas for developing future primary frequency standards; and (5) the relevance of frequency standards to other areas of metrology, including a unified standard concept. For individual titles, see N74-31156 through N74-31166.

N74-31156 National Bureau of Standards, Boulder, Colo.
BASIC CONCEPTS OF PRECISE TIME AND FREQUENCY
James A. Barnes *In its* Time and Freq. May 1974 p 1-40 refs (For availabilty see N74-31155 20-23)

A brief history of the scientific and engineering aspects of time and frequency is presented. A basic consideration of clocks and concepts involved in time measurements is developed. Time scales are described and delineated as either astronomical, atomic, or compromises thereof. Universal time scales are based on the apparent motion of the sun in the sky, while atomic time scales are related to periodic fluctuations of a radio signal in resonance with a certain species of atoms. A description of UTC system which commenced January 1, 1972 is provided. Characteristics and requirements of an International Atomic Time (TAI) scale indicate that the atomic time scale of the Bureau International de l'Heure (BIH) is a logical choice. However, the TAI scale will not replace some of the needs for astronomical time scales which are necessary for earth position. Details of constructing and maintaining an atomic time scale are included. Author

N74-31157 Army Electronics Command, Fort Monmouth, N.J.
STATE OF THE ART: QUARTZ CRYSTAL UNITS AND OSCILLATORS, PART A. PROGRESS IN THE DEVELOPMENT OF QUARTZ CRYSTAL UNITS AND OSCILLATORS SINCE 1966, PART B c26
Edvard A. Gerber and Roger A. Skyes *In* NBS Time and Freq. May 1974 p 41-64 refs (For availability see N74-31155 20-23)

The development and characteristics of quartz crystal controlled oscillators are discussed. The equivalent circuit of a crystal controlled oscillator is developed and the effects of the vibrator types, enclosures, quartz material, and modes of motion are analyzed. The characteristic frequency stability of an oscillator is examined with respect to the effects of temperature; aging; stress vibration, and acceleration; drive level, and nuclear effects. The various types of crystal controlled oscillators are identified and specific applications are reported. Author

N74-31158 National Bureau of Standards, Boulder, Colo.
THE PHYSICAL BASIS OF ATOMIC FREQUENCY STANDARDS c22
Allan S. Risley *In its* Time and Freq. May 1974 p 65-84 refs (For availability see N74-31155 20-23)
(NBS-TN-399)

The use of atomic materials for establishing frequency standards is discussed. The basic theory of atomic structure is presented as background to the frequency control development. The interaction between atoms and electromagnetic radiation is analyzed. The factors involved in choosing a suitable atom for a specific application are explained. Major examples of atomic frequency standards based on: (1) the hydrogen maser, (2) the cesium beam, and (3) the rubidium gas cell are reported. Author

N74-31159 National Bureau of Standards, Boulder, Colo.
A HISTORICAL REVIEW OF ATOMIC FREQUENCY STANDARDS, PART A. RECENT PROGRESS ON ATOMIC FREQUENCY STANDARDS, PART B c22
Roger E. Beehler *In its* Time and Freq. May 1974 p 85-109 refs (For availability see N74-31155 20-23)

Early experiments and subsequent development of basic techniques which resulted in the present atomic frequency standards are discussed. The atomic standard considered are: (1) cesium and thallium atomic beam devices, (2) rubidium gas cell devices, and (3) hydrogen masers. Circuit diagrams and illustrations of the atomic standard devices are provided. Advantages of the various methods of frequency stabilization are analyzed. Author

N74-31160 National Bureau of Standards, Boulder, Colo.
IMPROVEMENTS IN ATOMIC CESIUM BEAM FREQUENCY STANDARDS AT THE NATIONAL BUREAU OF STANDARDS, PART A. THE NEW PRIMARY CESIUM BEAM FREQUENCY STANDARD: NBS-5, PART B
David J. Glaze, Helmut Hellwig, Stephen Jarvis, Jr., Arthur E. Wainwright, and David W. Allan *In its* Time and Freq. May 1974 p 111-124 refs (For availability see N74-31155 20-23)

The development and operation of an atomic cesium beam frequency standards device are discussed. The accuracy capability of the system is defined. Modifications to the basic equipment for improved accuracy are explained. The accuracy capabilities of the system are tabulated. Specific accuracies obtained during performance tests of the device are analyzed. Author

N74-31161 National Bureau of Standards, Boulder, Colo.
AREAS OF PROMISE FOR THE DEVELOPMENT OF FUTURE PRIMARY FREQUENCY STANDARDS
Helmut Hellwig *In its* Time and Freq. May 1974 p 125-136 refs Reprinted from Metrologia (West Germany), v. 6, no. 4, Oct. 1970 p 118-126 Presented at 24th Ann. Symp. on Freq. Control, Atlantic City, 27-29 Apr. 1970 (For availability see N74-31155 20-23)

Methods and techniques for improving the fractional accuracy of frequency standard devices beyond ten to the minus thirteenth power are discussed. The influences which affect the frequency of a quantum electronic frequency standard are grouped into three classes: (1) effects associated with the interrogation of the atoms or molecules, (2) effects related to the method of confining the particles, and (3) the effects associated with the particles themselves and the way in which they are treated for an effective interrogation by electromagnetic fields. A review of existing and proposed devices is given, including quantitative data on the stability and accuracy capability. Author

N74-31162 National Bureau of Standards, Boulder, Colo.
ACCURATE FREQUENCY MEASUREMENTS: RELEVANCE TO SOME OTHER AREAS OF METROLOGY c15
Helmut Hellwig and Donald Halford *In its* Time and Freq. May 1974 p 137-149 refs (For availability see N74-31155 20-23)

Accurate frequency measurements in the microwave through the infrared regions as well as the imminent realization of accurate frequency measurements in the near infrared and visible regions are surveyed. Their significance on the system of basic standards and fundamental constants is discussed. The further possibility of one primary standard for many of the base units exists. Traditional beam techniques, storage methods, and infrared or visible radiation molecular absorptions appear as the most promising candidates for the primary frequency standard. Author

N74-31163 National Bureau of Standards, Boulder, Colo.
STATISTICS OF TIME AND FREQUENCY DATA ANALYSIS
David W. Allan, John H. Shoaf, and Donald Halford *In its*

Time and Freq. May 1974 p 151-204 refs (For availability see N74-31155 20-23)

Theoretical and practical approaches to the subject of measures for time and/or frequency deviations are discussed. General applications and examples of stability measures in the laboratory are reported. Standards of terminology and measurement techniques are recommended to facilitate conformity in reporting results from various laboratories with a commonality of reference. A glossary of terms, sample calculations and derivations, a frequency stability computer program, and selected references on frequency stability are included. Author

N74-31164 National Bureau of Standards, Boulder, Colo.
THE NATIONAL BUREAU OF STANDARDS ATOMIC TIME SCALE: GENERATION, STABILITY, ACCURACY AND ACCESSIBILITY **c22**
David W. Allan, James E. Gray, and Howard E. Machlan *In its* Time and Freq. May 1974 p 205-231 refs (For availability see N74-31155 20-23)

The atomic time scale at the National Bureau of Standards depends on an ensemble of continually operating cesium clocks calibrated occasionally by a primary frequency standard. The data of frequency calibrations and interlock comparisons are statistically processed to provide near optimum time stability and frequency accuracy. The noise spectrum for each clock is represented by a simple mathematical model, with parameters determined by the behavior of that clock. Specific applications of the time standards are described. The clocks provide part of the input to the International Atomic Time scale (TAI). The TAI scale is described and new proposals for improvement of this time scale are discussed. Author

N74-31165 National Bureau of Standards, Boulder, Colo.
TIME AND FREQUENCY DISSEMINATION: AN OVERVIEW OF PRINCIPLES AND TECHNIQUES
Byron E. Blair *In its* Time and Freq. May 1974 p 233-313 refs (For availability see N74-31155 20-23)

The basic concepts and common elements that characterize time and frequency dissemination are reviewed. The four main categories of dissemination are identified as: (1) Radio broadcasts; (2) on-site comparisons; (3) events in nature; and (4) hardline wire systems. Interrelated elements include active and passive transfer methods and supplementary techniques available from systems with differing primary objectives. The categories of time and frequency users are identified according to accuracy needs and means of providing these needs are shown. Various characteristics of time and frequency dissemination systems are charted and evaluated in terms of accuracy, ambiguity, geographical coverage, reliability, and cost of user equipment. Author

N74-31166 National Bureau of Standards, Boulder, Colo.
THE STANDARDS OF TIME AND FREQUENCY IN THE USA
James A. Barnes and Gernot M. R. Winkler (Naval Obs., Washington, D. C.) *In its* Time and Freq. May 1974 p 315-413 refs (For availability see N74-31155 20-23)

The national responsibilities for standards of time and frequency in the U.S.A. are defined. Specific functions of the National Bureau of Standards and the U.S. Naval Observatory are discussed. The international organizations involved in time and frequency are reported. A legal definition of the term standard time is provided. Author

N74-31167# Joint Publications Research Service, Arlington, Va.
WORKS OF THE FOURTH ALL-UNION SEMINAR ON STATISTICAL HYDROACOUSTICS
N. G. Gatkin, ed., V. G. Zagoruyko, ed., and V. V. Olshevskiy, ed. 16 Jul. 1974 316 p refs Transl. into ENGLISH of the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 330 p (JPRS-62481) Avail: NTIS HC $ 19.00

Mathematical models and calculations on random fields, statistical measurements and signal optimization are considered for solving hydroacoustic problems. For individual titles, see N74-31168 through N74-31204.

N74-31168 Joint Publications Research Service, Arlington, Va.
SYSTEMS ENGINEERING METHODS IN STATISTICAL HYDROACOUSTICS
E. I. Tsvetkov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 2-13 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 3-13 (For availability see N74-31167 20-23)

Implementation of the systems engineering approach to the synthesis of complex multifunctional hydroacoustic systems requires solutions for the following problems: (1) Formalized representation of the initial information; (2) methods for evaluating the quality of the system; (3) a complex set of standardized technical solutions for the modules entering into the hydroacoustic system; and (4) directional sorting of possible versions of the construction of hydroacoustic systems when determining the optimal one. Author

N74-31169 Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF SIGNALS PROPAGATED IN A WATER MEDIUM ON THE BASIS OF PROCESSING THEM BY STRUCTURAL PROPERTIES **c07**
A. M. Zayezdnyy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 14-24 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 14-22 (For availability see N74-31167 20-23)

The discussed approach can be of value in a number of applied hydroacoustic regions where the problems of diagnostics and classification of the processes are encountered. Structural relations are used to establish the form of the governing differential equation for the investigated process. The corresponding diagnostic unit is a set of oscillographs fed by various transformations of the initial process. Among the observed curves, the simplest is selected, and its approximating expression is the desired differential equation. Author

N74-31170 Joint Publications Research Service, Arlington, Va.
OPTIMAL PROCESSING OF NONSTATIONARY RANDOM HYDROACOUSTIC SIGNALS **c19**
V. V. Solodovnikov and V. F. Biryukov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 25-35 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 23-32 (For availability see N74-31167 20-23)

The general approach to the problems of optimizing linear systems on the basis of the theory of functional spaces and the theory of linear operators permits strict investigation of these problems from new points of view and leads to new statements and new methods of solving hydroacoustic problems. Author

N74-31171 Joint Publications Research Service, Arlington, Va.
SOME INTEGRAL RELATIONS CONNECTED WITH RANKING THE COMPONENTS OF A RANDOM VECTOR **c19**
I. P. Yudenkov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 36-39 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 33-35 (For availability see N74-31167 20-23)

In statistical hydroacoustics in connection with the applied problems encountered when processing the experimental data or when isolating the useful signals from noise, sometimes it becomes necessary to evaluate the results of the proposed ranking of a number of measured values (readings). Integral relations are presented that are valid for any distribution laws given by their densities. Author

N74-31172 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE UNPREDICTABLE COMPONENT OF ABSORPTION OF AN AQUEOUS MEDIUM ON THE MUTUAL CORRELATION OF THE REFERENCE AND USABLE SIGNALS **c07**
V. V. Olshevskiy and V. F. Pelevin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 40-51 refs Transl. into ENGLISH from the

book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 36-46 (For availability see N74-31167 20-23)

When investigating the properties of an aqueous medium as a communications channel, the properties of the reflecting objects, the mutual correlation processing of the reference signal and the useful signal received at some point of the medium, are used. The desired signal is obtained from the emitted signal by spectrum transformation. Author

N74-31173 Joint Publications Research Service, Arlington, Va.
MODELS OF HYDROACOUSTIC CHANNELS AND SIGNALS AND THEIR CORRELATION CHARACTERISTICS
V. V. Olshevskiy and Ye. I. Spitsyn *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 52-65 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 47-59 (For availability see N74-31167 20-23)

The standard scheme for the use of a hydroacoustic measuring system includes the following elements: (1) The source of the emitted signals; (2) the hydroacoustic channel (aqueous environment, investigated objects); and (3) the hydroacoustic information receiver. When studying the properties of an aqueous medium by hydroacoustic methods and also when solving various types of problems of the analysis and synthesis of hydroacoustic systems it is necessary to formulate mathematical models of the signals. These models must satisfy the following condition: on the adopted level of the probability description, the model must permit unique expression of the characteristics of the received signal s in terms of the characteristics of the emitted signal c and the channel h. Author

N74-31174 Joint Publications Research Service, Arlington, Va.
SPECTRAL REPRESENTATION OF NONSTATIONARY RANDOM PROCESSES **c19**
V. A. Geranin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 66-79 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 60-75 (For availability see N74-31167 20-23)

Six definitions of the spectrum of the nonstationary random process exist: the Rayevskiy, the Lampard, M. Levin, Priestly, Bendat-Pearsol, and Mark. The best is the spectrum which satisfies two requirements: it is convenient as a tool for spectral systems analysis and can be measured by technical means of acceptable complexity. Among the known ones of this type is the Rayevskiy spectrum. Author

N74-31175 Joint Publications Research Service, Arlington, Va.
PROBLEM OF THE FORMATION OF SOUND FIELDS UNDER THE CONDITIONS OF FORMATION OF SHADOW ZONES
V. M. Kudryashov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 80-88 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuzonoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 76-83 (For availability see N74-31167 20-23)

Seas and oceans can be considered as a nonuniform continuous medium, the parameters of which vary both in space and in time. A direct statistical approach is used for finding solutions to the equations describing certain statistical moments in a continuous medium under the effect of external forces. It is possible to represent the total sound field in the form of the superposition of waves of different scattering multiplicity. This representation describes the field in the shadow zone under the conditions of the formation of a surface waveguide. The corresponding formulas are presented. Author

N74-31176 Joint Publications Research Service, Arlington, Va.
CORRELATION CHARACTERISTICS OF MARINE REVERBERATION FROM A SOUND SCATTERING LAYER
T. A. Moroz *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 89-98 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 84-92 (For availability see N74-31167 20-23)

In this paper on the basis of the A wave model study has been made of the probability characteristics of reverberation from a sound scattering layer which is essentially the nonstationary process. The general relations have been established which relate the coherent and incoherent scattered signals and their spectra to the emitted signal. The time correlation function of the reverberation is expressed in terms of the spatial correlation function of the index of refraction of the layer. It has been demonstrated that the superposition theorems are valid only in the case where the characteristic radius of the correlation of the fluctuations of the index of refraction of the layer is small by comparison with the emitted wave length. Author

N74-31177 Joint Publications Research Service, Arlington, Va.
DIGITALIZATION OF A HYDROACOUSTIC SIGNAL **c19**
V. V. Petrov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 99-102 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 93-95 (For availability see N74-31167 20-23)

Certain aspects of digitalization of a continuous hydroacoustic signal are considered. The necessity for digitalization of the analog signal room a hydrophonic sensor occurs in particular when processing the hydroacoustic data on a digital computer. The sblution of the problem of how frequently it is necessary to take a sample essentially depends on the purpose of the processing, and a comparison is made with the effectiveness of the algorithms for processing the analog and the corresponding digital signals. Author

N74-31178 Joint Publications Research Service, Arlington, Va.
PHYSICAL PRINCIPLES OF SIMULATING SIGNALS UNDER THE CONDITIONS OF THE COMPLEX STRUCTURE OF AN ACOUSTIC FIELD
K. B. Vakar and V. R. Rzhevkin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 103-110 Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 96-104 (For availability see N74-31167 20-23)

The structure of hydroacoustic signals is determined by the processes of the sound propagation in a real medium and, consequently, construction of the mathematical model of the signal can be formulated in the following way: by studying the physical processes during the propagation of sound to find analytical relations and statistical properties of the individual parameters defining the structure of the signal as applied to the given classes of conditions, situations, and solved problems.
Author

N74-31179 Joint Publications Research Service, Arlington, Va.
ENERGY CHARACTERISTICS OF FAR REVERBERATION **c07**
K. B. Vakar, Ye. V. Kirillov, and N. I. Ovchinnikov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 111-115 Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 105-109 (For availability see N74-31167 20-23)

The variation in levels of marine reverberation with time or distance is considered for the case of far reverberation. The curve of the reverberation level variation with distance is determined not only by the distribution of the scatterers in the sound volume but also by the conditions of the sound propagation. It is shown that statistical characteristics of the far reverberation levels are closely connected with the structures of the sound fields under actual conditions of their spatial nonuniformity and nonstationarity. Author

N74-31180 Joint Publications Research Service, Arlington, Va.
MEASURING THE GLANCING ANGLES OF COMPONENTS OF A MULTIBEAM SIGNAL **c07**
V. A. Kakalov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 116-125 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike"

Novosibirsk, 1973 p 110-121 (For availability see N74-31167 20-23)

The occurrence of procedural error is considered when determining the sliding angles of correlated components of the multibeam signal in the far refraction zones by measuring the angles of peak signal intensities in the vertical plane using an antenna with limited spatial selectivity. The determination of the procedural error is made by comparing angular characteristics of the given multibeam structure and signal intensity in the vertical plane received during the process of measuring the angular distribution diagrams. The corresponding expression was obtained for the outward effect of the measuring system by considering the existence of the statistical relations between the components of the multibeam signal. Author

N74-31181 Joint Publications Research Service, Arlington, Va.
RESULTS OF EXPERIMENTAL STUDIES OF THE VERTICAL ANGULAR SPECTRA OF THE SOUND FIELD
V. V. Demyanovich, Ya. S. Karlik, and V. V. Semenov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 126-132 Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 122-129 (For availability see N74-31167 20-23)

Results are presented from experimental studies of the vertical angular spectra of the sound field in three different parts of the world ocean on a frequency below 1 kilohertz. Brief descriptions are given of the procedure, the experimental techniques and equipment. It is concluded that the sound field in the investigated regions has an explicitly expressed anisotropy of intensity in the vertical plane. Vertical angular intensity spectra obtained satisfactorily coincide with angular spectra calculated by using the beam acoustic methods. Author

N74-31182 Joint Publications Research Service, Arlington, Va.
PROBLEM OF OPTIMIZING SIGNALS IN CORRELATORS FOR COMMUNCATIONS VIA A HYDROACOUSTIC CHANNEL WITH PARAMETERS WHICH VARY IN TIME c07
S. D. Chuprov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 133-141 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 130-138 (For availability see N74-31167 20-23)

For a model of a communications channel in the form of a stochastic linear filter the integral equation was obtained which satisfies the optimal mutual indeterminacy function of the transmitted and reference signals in the standard correlation detection scheme. It is demonstrated that the matching conditions of the two successively included stochastic filters is invariant with respect to the arrangement of the filters. Author

N74-31183 Joint Publications Research Service, Arlington, Va.
PROPAGATION OF A MODULATED NOISE SIGNAL IN A MULTIBEAM CHANNEL WITH CONSTANT PARAMETERS c07
E. P. Gulin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 142-151 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 139-147 (For availability see N74-31167 20-23)

In cases where the disturbances in the volume of the marine environment and on the bounding surfaces are weakly expressed, the propagation of acoustic signals in the sound frequency range in the deep sea can be approximately described by a model of the linear multibeam channel with constant parameters. The multibeam nature leads to distortions of the time and spectral structure of the signals. In the case of radiation close to monochromatic, the interference phenomena caused by movement of the receiver with respect to the radiator are transformed into interference fading. Analogous distortions of an interference nature can also be experienced by noise like wide band signals. Author

N74-31184 Joint Publications Research Service, Arlington, Va.
SOME LOCAL SCATTERING CHARACTERISTICS OF ULTRASOUND BY THE SURFACE AERATED LAYER OF THE SEA DURING VERTICAL SOUNDING c07
A. P. Aleksandrov and E. S. Vayndruk *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 152-160 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 148-157 (For availability see N74-31167 20-23)

When using hydroacoustic instruments it is necessary to consider the scattering of the sound in the air bubbles formed on breaking of the crests of the wind driven waves and distributed in the surface layer of the sea. Numerous air bubbles are capable of shielding the sea surface from acoustic signals or lead to attenuation and distortion of the signals sent from the surface into the water. The basic method of studying the bubble (aerated) layer is the analysis of the energy and statistical properties of reverberation caused by air bubbles. The reverberation is investigated by evaluating local characteristics of the aerated layer, its dynamic structure, the laws of formation, and the effect of the layer on acoustic signals under various hydrometeorological conditions. Author

N74-31185 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF SURFACE REVERBERATION DURING LOCAL IRRADIATION OF SEAWATER c07
E. S. Vayndruk and A. S. Paritskiy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 161-171 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 158-167 (For availability see N74-31167 20-23)

Measurements of reverberation characteristics during scattering of ultrasound from a sea wave surface are statistically evaluated to obtain detailed information about scattering properties of various sections of the sea wave. The leading front of the envelope of the averaged reverberation surface is defined by the duration of the ultrasonic pulse, the height of the ripple on the surface of the wave as an exponential function of magnitude and azimuth of wave slope, the radius of the ultrasonic spot and the mean square slope of the facets. G.G.

N74-31186 Joint Publications Research Service, Arlington, Va.
ALGORITHMS FOR OPTIMAL SPACE-TIME PROCESSING OF RANDOM FIELDS c08
N. G. Gatkin *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 172-194 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 168-200 (For availability see N74-31167 20-23)

The reception of a noise Gaussian signal against a background of Gaussian interference is studied for the case of discrete antenna. Algorithms are formulated for optimal space-time processing of an exactly known signal, a signal with random initial phase, a signal with fluctuating amplitude and inital phase, and a two component signal. Optimal algorithms are found by approximations depending on the volume of information about the mixed moments of signal and noise. Author

N74-31187 Joint Publications Research Service, Arlington, Va.
DETECTION OF NOISE SIGNALS IN A FIELD OF DISTRIBUTED AND LOCAL INTERFERENCE c07
N. G. Gatkin, V. S. Gorbenko, S. N. Zaliznyak, and D. G. Krasnyy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 195-203 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 201-212 (For availability see N74-31167 20-23)

Algorithms are formulated for optimal and quasi-optimal processing of Gaussian noise signals in a field of Gaussian interference created by distributed and local sources. Optimal receiver processing of the Gaussian signal in the Gaussian interference field is described by space-time correlation functions of signal interference and the sum of signal and noise, respectively. G.G.

N74-31188 Joint Publications Research Service, Arlington, Va.
INDETERMINACY FUNCTION FOR OPTIMAL SPACE-TIME PROCESSING OF SIGNALS c07

Yu. D. Bozhok, N. G. Gatkin, M. I. Karnovskiy, L. G. Krasnyy, and S. V. Pasechnyy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 204-209 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 213-220 (For availability see N74-31167 20-23)

The definition of the indeterminacy function is applied to the problems of time processing of signals against a background of nonwhite, nonstationary interference. The results are generalized to the case of the space-time processing of signals considering radiation patterns of an optimal linear antenna comprising n receivers located at a distance from each other. Author

N74-31189 Joint Publications Research Service, Arlington, Va. **NOISEPROOFNESS OF OPTIMAL RECEIVERS FOR THE TWO-COMPONENT SIGNAL** c07

N. G. Gatkin and V. M. Pyanov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 210-216 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 221-228 (For availability see N74-31167 20-23)

A set of calculation expressions and graphs is obtained which permits a comparative estimate to be made of the noiseproofness of optimal channels when receiving a two-component signal and to discover losses in noiseproofness when receiving a signal which is nonoptimal for the given signal. The methods obtained can also be useful for the selection of the type of receiving channel. Author

N74-31190 Joint Publications Research Service, Arlington, Va. **DETECTION CHARACTERISTICS OF THE STANDARD CHANNEL WHEN RECEIVING A TWO-COMPONENT SIGNAL** c07

V. M. Pyanov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 217-222 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 228-234 (For availability see N74-31167 20-23)

The detection characteristics for the IBF-CD-II for M = 100 are presented. Data are developed that permit a comparison of noiseproofness for the deterministic and noise components of the signal. The presence of the noise component of the signal leads to a noticeable increase in the probability of correct detection. Author

N74-31191 Joint Publications Research Service, Arlington, Va. **SIGNAL DETECTION IN THE PRESENCE OF NONGAUSSIAN NOISE** c07

N. G. Gatkin and V. L. Kramarenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 223-228 refs Transl. into ENGLISH of the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 235-240 (For availability see N74-31167 20-23)

Detection of a deterministic signal is considered against a background of nongaussian noise in a radio pulse. By a method of statistical simulation on a digital computer, the detection characteristics of the channel are obtained where the processing algorithm of the channel is the quadratic approximation of the Delta-optimal functional. Author

N74-31192 Joint Publications Research Service, Arlington, Va. **PROBLEM OF CALCULATING THE CORRELATION FUNCTIONS OF ECHOES FROM A CIRCULAR CYLINDER OF FINITE ALTITUDE** c07

L. Ya. Taradanov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 229-231 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 241-243 (For availability see N74-31167 20-23)

When planning and designing channels for the detection and processing of hydroacoustic signals it is necessary to have information about the mutual correlation function of the main bang and the echo. Problems pertaining to the calculation of the mutual correlation function of the main bang and echo from a circular cylinder of finite altitude are studied by considering the properties of a reflector. Author

N74-31193 Joint Publications Research Service, Arlington, Va. **ACCUMULATION OF FLUCTUATING PULSE SIGNALS WITH DIFFERENT PROBABILITY DISTRIBUTIONS** c07

V. V. Olshevskiy and S. L. Pivovarov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 232-237 Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 244-250 (For availability see N74-31167 20-23)

The problem of statistical multichannel sonar is considered where accumulation is characteristic in signal detection and where the noise at the input of the adder is Gaussian with a zero mean value and dispersion identical for all channels. The sum of the signal and noise at adder input is described by a probability density function. A decision making rule decides whether a signal is present or absent in order to define provisional probabilities of false alarm and proper detection. G.G.

N74-31194 Joint Publications Research Service, Arlington, Va. **APPLICATION OF CEPSTRAL ANALYSIS IN PROCESSING HYDROACOUSTIC SIGNALS** c19

I. Vorobyev *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 238-242 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 251-255 (For availability see N74-31167 20-23)

The so-called cepstral analysis known from studies of voice signals is based on calculating the energy spectrum of the logarithm of the power spectrum of the investigated signal. The oscillation characteristic obtained in this way is called the Cepstrum. The possibility is discussed of using this analysis to investigate hydroacoustic signals in an example for active location of spatially extended objects by applying a linear model of propagation and reflection of acoustic vibrations. Author

N74-31195 Joint Publications Research Service, Arlington, Va. **ALGORITHM FOR DETECTING A SIGNAL IN NOISE OF UNKNOWN INTENSITY** c19

A. N. Orlichenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 243-250 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 256-264 (For availability see N74-31167 20-23)

Signal detection algorithms are formulated by using the differences in the uniform statistical characteristics of signal and noise. Their application does not require exact tuning of the receiver and insures independence of the probability of false alarm with respect to oscillation level at receiver input. Author

N74-31196 Joint Publications Research Service, Arlington, Va. **COMPARATIVE ANALYSIS OF THE NOISEPROOFNESS OF CERTAIN TYPES OF MANIPULATION WHEN TRANSMITTING TELEMETRIC INFORMATION OVER A HYDROACOUSTIC CHANNEL** c07

S. P. Rokotov and Yu. M. Yablonokiy *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 251-256 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 265-270 (For availability see N74-31167 20-23)

When estimating the noiseproofness of the hydroacoustic telemetric systems it is necessary to consider the peculiarities of the marine environment. An effort is made to apply some of the results of the general communications theory to hydroacoustic channels. A solution to the wave equation by the small perturbation method is used to represent signal pressure at the reception point in the form of sums of regular and random components so that an analogous representation of the signal occurs for scattering nonrandom nonuniformities of the environment and a statistically rough surface. Mean square pressure of the signal is expressed in terms of amplitude of the regular component and dispersion of the random component. The relation

between regular and random components is the normalized value of the pressure field fluctuation. Author

N74-31197 Joint Publications Research Service, Arlington, Va.
SYSTEMS APPROACH TO THE CONSTRUCTION OF DYNAMIC MODELS IN HYDROACOUSTICS
A. M. Reznik *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 257-265 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 271-280 (For availability see N74-31167 20-23)

A mathematical dynamic model for a set of signals is obtained in the form of binary elements encompassed by a potential field of mutual stimulation that is in practice inseparable from the existing concept of the neuron net of the brain. This fact indicates the expediency of the bionic approach to constructing dynamic models as prototypes of biological analyzers capable of distinguishing given classes of signals. Considering the general complexity of studying the structures of real dynamic models, this path appears the most prospective both for discovering the structures of the trainable dynamic models and the establishment of the nature of the Green operator coordinating the training of the elements of such structures. Author

N74-31198 Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF THE OUTPUT RESPONSE IN A SIGNAL PROCESSING SYSTEM WITH HYPERBOLIC FREQUENCY MODULATION c07
Ye. B. Libensen *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 266-275 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 281-290 (For availability see N74-31167 20-23)

Movement of a radiator or receiver causes the Doppler effect to be exhibited not only in the mean frequency shift but also in its time scale variations. The response level at the output of the processing device is determined by the spectral width of the signal and its duration considering the decrease in mean signal frequency as a result of distortions of the modulating function. An analysis of the properties and response parameters at the output of a hyperbolic frequency modulation signal processing system is included where the central filter is matched, and where the remaining filters differ from the central filter only by the magnitude of the mean frequency. Author

N74-31199 Joint Publications Research Service, Arlington, Va.
MUTUAL CORRELATION PROCESSING OF NARROW-BAND SIGNALS BASED ON FAST FOURIER TRANSFORMATION c07
I. B. Vaysman and K. P. Lvov *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 276-278 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 291-293 (For availability see N74-31167 20-23)

An important characteristic for experimental studies of the conditions of underwater observation and the properties of the location targets is the finite mutual correlation function of the emitted signal and the echo. Main bang and echo models are described in the input language of the TA-IM translator. For simulation of the main bangs, the mathematical models of the radio pulses with rectangular and bell-shaped envelopes are used. The duty cycle is tonal and linear-frequency modulated. The simulation of the echo is constructed on the basis of the mathematical model of the echo, its known shape and additive random component. Results of simulating the mutual correlation processing by using the FFT algorithm in the absence of the additive component in the echo model coincide with known relations obtained when analyzing the indeterminacy functions of the signals. Author

N74-31200 Joint Publications Research Service, Arlington, Va.
EFFECTIVENESS OF ESTIMATING THE UNKNOWN PARAMETER IN A HYDROACOUSTIC MEASUREMENT PROBLEM c19
V. I. Paderno and I. R. Romanovskaya *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 279-285 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 294-299 (For availability see N74-31167 20-23)

In hydroacoustic measurement practice frequently the measurement accuracy depends on the measured parameter. It is possible to indicate the measurement of the signal/noise ratio by finding the best estimate for the unknown parameter. A specific example is reported where the estimate has a normal distribution law with mathematical expectation equal to the true value of the unknown parameter and with a standard proportional to the unknown parameter. The proposed unbiased estimate of the unknown parameter has minimum dispersion in a class of unbiased estimates, and the property of asymptotic effectiveness. Author

N74-31201 Joint Publications Research Service, Arlington, Va.
DECREASING THE EFFECT OF MULTIPLICATIVE NOISE BY USING AUTOMATED CONTROL c07
N. V. Karpov and V. V. Yaromenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 286-290 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 300-304 (For availability see N74-31167 20-23)

The problem is considered of decreasing the effect of multiplicative noise in the distortions of statistical signal characteristics by evaluating noise attenuation through an automatic control system. The regulating oscillation is obtained by passing an auxiliary signal together with the regular signal through the system. The regulating voltage is obtained by using an auxiliary signal in the presence of an additional channel to correlate the multiplicative effect to the effect in the basic channel. Author

N74-31202 Joint Publications Research Service, Arlington, Va.
ERRORS IN MEASURING THE CHARACTERISTICS OF SIGNALS WITH STORAGE ON MAGNETIC RECORDERS c07
N. V. Karpov and V. P. Peshkovfrom *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 291-297 ref Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 305-312 (For availability see N74-31167 20-23)

The experimental study and theoretical analysis of the harmful effect of spurious amplitude modulation and spurious frequency modulation fluctuations on the useful signals stored by means of magnetic recorders indicate that magnetic recorders can be compared among each other by certain different criteria. In the magnetic recorders already built it is very important to find methods of reducing the magnitude of the spurious amplitude modulation and especially the spurious frequency modulation arising primarily as a result of nonuniform movement of the carrier in order to improve the quality of storing the information. As the experimental results indicate, the presence of significant mutual correlation among the fluctuations of the spurious frequency modulation in adjacent channels of the magnetic recorders indicates the expediency of using the reference channel for significant reduction of the spurious frequency modulation fluctuations. Author

N74-31203 Joint Publications Research Service, Arlington, Va.
PROCESSING SOME NONSTATIONARY PROCESSES ON A DIGITAL COMPUTER c08
I. I. Shilovich, A. M. Zemskov, Yu. P. Makarenko, and B. Ya. Li *In its* Works of the 4 th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 298-305 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 313-321 (For availability see N74-31167 20-23)

Quantitative statistical characteristics of the marine reverberation are obtained by computer analyses of nonstationary processes. Reverberation is expressed in the variation with time of the mathematical expection, the dispersion, the correlation interval, and the distribution laws. A polynomial smoothing method is used to isolate the nonstationary low frequency component and the quasistationary high frequency component from the reverbera-

tion envelope. Results of spectral and correlation analyses show that, although the instanteous values of the reverberation are distributed according to a normal law and its envelope according to the generalized Raleigh law, the parameters of these laws vary with time. G.G.

N74-31204 Joint Publications Research Service, Arlington, Va.
INCREASING THE ACCURACY OF CALCULATING THE HIGHER ORDER MOMENTS OF RANDOM PROCESSES WITH A FINITE RANGE OF VALUES c19
V. S. Miroshnichenko and V. K. Ponomarenko *In its* Works of the 4th All-Union Seminar on Statist. Hydroacoustics (JPRS-62481) 16 Jul. 1974 p 306-311 refs Transl. into ENGLISH from the book "Trudy Chetvertoy Vsesoyuznoy Shkoly-Seminara po Statisticheskoy Gidroakustike" Novosibirsk, 1973 p 322-327 (For availability see N74-31167 20-23)

The error in calculating high order moments, limited with respect to value of the random processes (the distribution of the instantaneous values of the harmonic oscillation with random initial phase, the Simpson distribution and uniform distribution), can be reduced by introducing the correction factor into the formula for approximate integrations. By selecting the correlation factor which depends on the type of distribution and the number of levels of analysis, it is possible to obtain errors in the calculations of the high order moments which are very small. Author

N74-31205# Lubman (D.) and Associates, Woodland Hills, Calif.
REVIEW OF REVERBERANT SOUND POWER MEASUREMENT STANDARD AND RECOMMENDATIONS FOR FURTHER RESEARCH
Aug. 1974 21 p refs Sponsored by NBS
(NBS-TN-841) Avail: SOD HC $0.60 as C13.46:841

A critical review was made of American National Standard S1.21-1972, Methods for the determination of sound power levels of small sources in reverberation Rooms. This standard, as now embodied, represents a major advance in the state-of-the-art of reverberation room measurement of sound power. Efforts were made to prepare additional analytical and experimental information needed for further refinement of this standard. A detailed critique is presented of specific items in the standard. Indications are given of both general research areas for statistical room acoustics and of specific research areas for improved reverberant room sound power measurements. Author

N74-31206*# Rocketdyne, Canoga Park, Calif.
ADVANCED ACOUSTIC CAVITY TECHNOLOGY Final Report
W. S. Hines, C. L. Oberg, and L. Kusak Jun. 1974 100 p refs
(Contract NAS9-12077)
(NASA-CR-134388; R-9136) Avail: NTIS HC $8.00 CSCL 20A

A series of rocket motor firings was performed in a modified linear aerospike thrust chamber with the H2/O2 propellant combination to allow determination of the physical properties of the combustion gases in acoustic cavities located in the chamber side walls. A preliminary analytical study was first conducted to define theoretically both the appropriate cavity dimensions and the combustion gas flow field adjacent to the cavity openings. During the subsequent motor firings, cavity gas temperature profiles were measured and gas samples were withdrawn from the bottom of the cavities for compositional analysis by measurement of pressure/temperature variation and gas chromatography. Data were obtained with both radially and axially oriented cavities and with and without hydrogen bleed flow through the cavities. A simplified procedure was developed for predicting gas cavity and acoustic velocity for use in acoustic cavity design analyses. Author

N74-31207# Joint Publications Research Service, Arlington, Va.
WORKS OF THE FIRST ALL-UNION SCHOOL-SEMINAR ON HYDROACOUSTICS
N. G. Zagoruyko, ed. and V. V. Olshevskiy, ed. 5 Jul. 1974 180 p refs Transl. into ENGLISH of the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 200 p (JPRS-62406) Avail: NTIS HC $12.00

Different aspects of statistical hydroacoustics are considered. In particular, questions of the description of hydroacoustic signals, statistical measurements, and signal recognition were examined. Different mathematical models of a hydroacoutic medium were also examined. For individual titles, see N74-31208 through N74-31221.

N74-31208 Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODELS AND THE STATISTICAL DESCRIPTION OF HYDROACOUSTIC SIGNALS
V. V. Olshevskiy *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 1-28 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 1-33 (For availability see N74-31207 20-23)

Two approaches, the wave and phenomenological, for developing mathematical models of hydroacoustic signals in aqueous media, are reported. Statistical characteristics, properties, and heterogeneities of the media are discussed. E.H.W.

N74-31209 Joint Publications Research Service, Arlington, Va.
METHOD OF CANONICAL REPRESENTATION OF A RANDOM FIELD WITH ARBITRARY SPATIAL CHARACTERISTICS
N. D. Dendebera *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 29-33 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 34-38 (For availability see N74-31207 20-23)

Data are reported on the canonical representation of random functions and their use in solving statistical problems. Problems considered include normality and probability distribution. Spatial characteristics of the random field are discussed. E.H.W.

N74-31210 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE SPECTRAL CHARACTERISTICS OF MARINE REVERBERATION DURING MOVEMENT OF ACOUSTICAL ANTENNAS
A. I. Paperno *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 34-39 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 39-45 (For availability see N74-31207 20-23)

The frequency spectrum of marine reverberation was examined giving consideration to the motion of acoustical antennas. In that case the scatterers are assumed to be immobile. Conclusions show that: (1) the amount of widening of the frequency spectrum of marine reverberation depends on the value of the working frequency; and (2) the form of directional characteristics of the radiating and receiving antennas and their orientation in relation to the direction of motion has its largest values at angle phi = 90 deg. Author

N74-31211 Joint Publications Research Service, Arlington, Va.
CORRELATION FUNCTION AND THE REVERBERATION SPECTRUM OF FREQUENCY-MODULATED AND TONAL PULSES
B. I. Shotskiy *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 40-44 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 46-50 (For availability see N74-31207 20-23)

Reverberation of the sea, on the intake of a transceiving antenna at the moment during the radiation of the signal, was analyzed using an autocorrelation function. Random processes, spectral density, and frequency amplitude were discussed. E.H.W.

N74-31212 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF MOTION OF THE RECEIVER (RADIATOR) OF NARROW-BAND ACOUSTIC SIGNALS ON THEIR FREQUENCY SPECTRUM DURING PROPAGATION OF SIGNALS IN AN UNDERWATER SOUND CHANNEL
V. I. Paderno and A. I. Paperno *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 45-48 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminar po Gidroakustike" Novosib-

irsk, Izdatel'stvo Nauka, 1970 p 51-54 (For availability see N74-31207 20-23)

The influence of motion of the receiver (radiator) of acoustic signals propagating in an underwater sound channel on their frequency spectrum was examined. The posed problem, with reference to long tonal signals propagating along water beams without reflection from the surface and bottom of the sea, was solved. A calculation is presented of the frequency spectrum of a signal. Author

N74-31213 Joint Publications Research Service, Arlington, Va.
STATISTICAL DESCRIPTION OF SOME TYPES OF NON-GAUSSIAN PROCESSES IN HYDROACOUSTICS
I. A. Aleksandrov and V. V. Olshevskiy *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 49-62 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 55-73 (For availability see N74-31207 20-23)

A mathematical model for determining statistical characteristics of nonGaussian random processes is reported. Determinations were made of unidimensional probability distributions and the corresponding numerical characteristics of those distributions. Author

N74-31214 Joint Publications Research Service, Arlington, Va.
HYDRODYNAMIC EXCITATION OF ELASTIC SHELLS
V. I. Klyachkin *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 63-83 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 74-97 (For availability see N74-31207 20-23)

A Reynolds form wave equation was developed to study hydrodynamic excitation of elastic shells. Special attention was given to statistical connections of pulsations of velocity and its derivatives in a turbulent boundary layer. E.H.W.

N74-31215 Joint Publications Research Service, Arlington, Va.
PROBLEMS OF STATISTICAL MEASUREMENTS IN HYDROACOUSTICS
E. I. Tsvetkov *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 84-99 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 98-112 (For availability see N74-31207 20-23)

Procedures for statistical measurements in hydroacoustics and their precision are discussed. Some aspects of the dependence of measurement precision on the volume and character of the a priori in information on the properties of the investigated process were also examined. Procedures for the measurement of statistical characteristics of random processes were divided into two types: (1) measurements made to elaborate and refine mathematical models of an investigated random process, and (2) measurements made to obtain quantitative data on the values of parameters, functionals, or functional dependences characterizing the given process in order to assure the possibility of solving a concrete problem. Statistical measurement errors were analyzed. Author

N74-31216 Joint Publications Research Service, Arlington, Va.
METHOD OF MEASUREMENT OF CURRENT COORDINATES OF SIGNAL SOURCES
A. M. Zufrin *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 100-138 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 113-154 (For availability see N74-31207 20-23)

Attempts are made to develop instruments to automatically measure the angular position and time of arrival of the phase front of signals. The system also determines information on current coordinates of signal sources. E.H.W.

N74-31217 Joint Publications Research Service, Arlington, Va.
THE PROCESSING OF HYDROACOUSTIC DATA IN THE PRESENCE OF GAUSSIAN NONSTATIONARY NOISE
N. G. Gatkin *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 139-160 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 155-180 (For availability see N74-31207 20-23)

Under real conditions of radar the presence of nonstationary nonwhite Gaussian noise was observed. Data cover: (1) optimal detection - the structure and noise stability of optimal receivers, (2) non-optimal detection - the noise stability of non-optimal receivers, and (3) measurement of signal parameters. Author

N74-31218 Joint Publications Research Service, Arlington, Va.
A SPECIALIZED DIGITAL COMPUTER FOR CORRELATION ANALYSIS **c08**
G. Sh. Avetisov *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 161-164 Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 181-185 (For availability see N74-31207 20-23)

The development of a special arithmetic digital computer to solve problems in the diagnosis and recognition of images is reported. This special computer was also used to calculate correlation coefficients of several random functions with high precision on a real time scale. Author

N74-31219 Joint Publications Research Service, Arlington, Va.
METHODS OF IMAGE RECOGNITION AND POSSIBILITIES OF THEIR APPLICATION IN HYDROACOUSTICS **c08**
N. G. Zagoruyko *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 165-171 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 186-193 (For availability see N74-31207 20-23)

The construction of decisive functions as a basis in developing methods of image recognition is discussed. Image recognition and its use in hydroacoustics was evaluated as well as cost of errors in recognition and cost of recognition equipment. Author

N74-31220 Joint Publications Research Service, Arlington, Va.
PARAMETRIC REPRESENTATION OF QUASI-HARMONIC SIGNALS
B. M. Kurilov *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS-62406) 5 Jul. 1974 p 172-173 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 194-195 (For availability see N74-31207 20-23)

A method for obtaining a parametric description of quasi-harmonic hydroacoustic signals is given. The application of the method to initial spaces of parameters for solving the task of image recognition on the basis of hydro-acoustic signals was investigated. E.H.W.

N74-31221 Joint Publications Research Service, Arlington, Va.
FORMATION OF AN INFORMATIVE SYSTEM OF SIGNS FOR SIGNAL RECOGNITION **c08**
T. N. Gadi and V. I. Kotyukov *In its* Works of the 1st All-Union School-Seminar on Hydroacoustics (JPRS62406) 5 Jul. 1974 p 174-177 refs Transl. into ENGLISH from the book "Trudy Pervoy Vsesoyuznoy Shkoly-Seminara po Gidroakustike" Novosibirsk, Izdatel'stvo Nauka, 1970 p 196-200 (For availability see N74-31207 20-23)

A formation algorithm, representing an iterational procedure, for signal recognition is disclosed. The possibility of selecting a subsystem of the most informative initial signs was examined as well as a formation algorithm which takes into consideration specific features of Boolean space. E.H.W.

N74-31222# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
MICROWAVE ACOUSTICS HANDBOOK. VOLUME 1A: SURFACE WAVE VELOCITIES Physical Science Research Papers.
A. J. Slobodnik, Jr., E. D. Conway, and R. T. Delmonico 1 Oct. 1973 726 p refs
(AF Proj. 5573)
(AD-780172; AFCRL-TR-73-0597-Vol-1A; AFCRL-PSRP-565)
Avail: NTIS CSCL 09/1

Information essential for the design of acoustic surface wave filters, signal processors, and other miniature, low cost, reliable devices for use in communications and electronic sensing is given in this report. Computations of surface wave velocity and electromechanical power flow angle, and estimates of surface wave coupling to interdigital transducers are given for various orientations of the following surface wave substrate materials: Ba2NaNb5O15, Bi12GeO20, CdS, Diamond, Eu3Fe5O15, Gadolinium Gallium Garnet, GaAs, Germanium, InSb, InAs, PbS, LiNbO3, MgO, Quartz, Rutile, Sapphire, Silicon, Spinel, TeO2, YAG, YGaG, YIG, and ZnO. Particular cuts of interest are then chosen for more detailed numerical calculations of mechanical and electrical parameters governing acoustic wave propagation in crystalline media. Similar data is given for common metals. A list of material constants and a bibliography of 520 surface wave papers are also included. Author (GRA)

N74-31223# Rome Air Development Center, Griffiss AFB, N.Y.
FOUNDATIONS OF DIFFRACTION THEORY Technical Report, Jan. 1972 - Mar. 1973
Andrew R. Pirich Jun. 1974 58 p refs
(AD-780506; RADC-TR-74-166) Avail: NTIS CSCL 20/6

The intent of this report is to synopsize the Scaler and Vector Diffraction Phenomena that characterize the electromagnetic effects of the Fresnel (nearfield) and Fraunhofer (far-field) Diffraction. Included in this report are the author's views concerning electromagnetic phenomena at the aperture by employing Babinet's Principle. (Modified author abstract) GRA

N74-31224# Royal Armament Research and Development Establishment, Fort Halstead (England).
AN INVESTIGATION INTO THE EFFECTS OF SCATTERED RADIATION UPON IMAGE SHARPNESS AND CONTRAST USING COBALT-60 GAMMA RADIATION AND STEEL PLATES IN THE THICKNESS RANGE 20 TO 100 mm
M. Dowd and R. Halmshaw Mar. 1974 16 p refs
(AD-780348; RARDE-Memo-1/74; BR40264) Avail: NTIS CSCL 14/2

The effect of scattered radiation generated in the specimen, on the image of detail on a radiograph, was studied, using Cobalt-60-gamma-rays and steel plates. It is found, contrary to some other published work, that there is no effect on image sharpness, due to the scattered radiation. Author (GRA)

N74-31225# Naval Electronics Lab. Center, San Diego, Calif.
DESIGN OF OPTICAL CIRCUITS Research and Development Report, Jul. 1972 - Jan. 1974
H. F. Taylor 2 Apr. 1974 70 p refs
(RR0141104; NELC Proj. F212)
(AD-779847; NELC-TR-1913) Avail: NTIS CSCL 20/6

The report discusses new concepts in the areas of waveguide interconnection losses, switches and switching networks, and frequency-selective and broadband directional couplers derived from a theoretical analysis of propagation in optical waveguide components. It lists the functions which IOCs are expected to perform and suggests specific configurations for avionics information transfer and processing systems using IOC components. Author (GRA)

N74-31226# Monsanto Research Corp., Dayton, Ohio.
PLANER HIGH ENERGY PERMANENT MAGNETS Semiannual Report, 1 Oct. 1973 - 28 Feb. 1974
M. C. Willson and R. J. Janowiecki May 1974 49 p refs
(Contract DAAB07-73-C-0112; DA Proj. 1T7-62705-A-348)
(AD-780085; ECOM-0112-2-73) Avail: NTIS CSCL 09/1

The purpose of the program is to demonstrate the feasibility of fabricating cobalt-rare earth permanent magnets by the arc plasma spraying process. Property goals for spray-fabricated magnets consisted of a coercive force of 6000 oersteds and an energy product of 8 million gauss-oersteds. During this reporting period, magnet samples were fabricated in disk and tube shapes mostly using a spray powder of nominal composition 37.2 wt.% Sm-Co. Magnetic properties of sprayed magnets were enhanced by post-spray heat treatment and aging. Conventional and novel heat treatment methods were investigated. Second and third quadrant demagnetization curves were obtained. Density, microstructure, crystallographic orientation, reproducibility and thermal stability were studied. The best magnet produced during this program displayed a coercive force of approximately 5000 oersteds and an energy product of 7.3 million gauss-oersteds. Author (GRA)

N74-31227# Radio Corp. of America, Princeton, N.J.
ELECTRO-OPTIC WAVEGUIDES Final Report, 6 Apr. 1973 - 6 Jan. 1974
Jacob M. Hammer, Michael T. Duffy, and William Phillips 30 Apr. 1974 65 p refs
(Contract N00014-73-C-0388; NR Proj. 009-008)
(AD-778762; PRRL-74-CR-32) Avail: NTIS CSCL 20/6

Excellent electro-optic waveguide modulators have been developed using thin films of both ZnO and LiNb(x)Ta(1-x)O3 (LNT). In each case the performance lived up to theoretical predictions. Numerous problems affecting the operation of low-loss ZnO thin-film waveguide modulators have been solved so that stable operation has been achieved. Of the undiffracted beam 80% may be switched with 80 V applied to the device, representing an order of magnitude reduction in drive voltage compared with that of bulk modulators. The discovery of the LNT waveguides has led to yet another order of magnitude improvement in device performance. Waveguide modulators have been constructed that have operational losses less than 1 db/cm and switch essentially 100% of 4976-A light with 8 V applied. Preliminary characterization of the waveguides in terms of formation parameters and optical performance has been made. Author (GRA)

N74-31061 Joint Publications Research Service, Arlington, Va.
CORRELATION CHARACTERISTICS OF A PRESSURE FIELD IN THE SPACE BETWEEN TWO OSCILLATING INFINITE PLATES
V. I. Klyachkin and B. N. Platunova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 104-106 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 108-110 (For availability see N74-31043 20-19)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-31228+ Maryland Univ., College Park.
THE BEHAVIOR OF CHARGED PARTICLE DISTRIBUTIONS IN TIME-INDEPENDENT STOCHASTIC MAGNETIC FIELDS Ph.D. Thesis
Thomas Burton Kaiser 1973 151 p
Avail: Univ. Microfilms Order No. 74-17045

The evolution in time of a distribution of charged particles in a static magnetic field which possesses an appreciable random component is considered. Such a field provides a model that is compatible with observations of the magnetic field in the solar wind. Quasilinear theory, which is the lowest-order non-trivial approximation to the general perturbation scheme commonly used to derive a kinetic equation for the pitch-angle distribution function, is shown to breakdown for pitch angles near pi/2. This failure is due to the incorrect description of particle orbits at such pitch angles that is inherent in the standard perturbation method. A new perturbation formalism is proposed which is based on an improved representation of particle trajectories that includes the essential effect of the random component of the field. Dissert. Abstr.

N74-31229 Iowa Univ., Iowa City.
EFFECTS OF INTERPLANETARY SHOCK WAVES ON ENERGETIC CHARGED PARTICLES Ph.D. Thesis
Emmanuel T. Sarris 1973 273 p
Avail: Univ. Microfilms Order No. 74-16682

The influence of interplanetary magnetic discontinuities on energetic charged particles were studied. Emphasis is given to the acceleration of protons in almost perpendicular shock waves.

The special case of protons accelerated in ideal perpendicular shock waves is treated analytically. The protons gain energy by repeated crossings of the shock front until they are finally permanently transmitted downstream. The resulting energy gain complies with the conservation of the first adiabatic invariant. It is found that the times required by protons in order to reach a given relative energy gain at the shock front are longer for higher proton energies. In about 3 min a 0.3 MeV proton has almost tripled its energy at a shock front of strength 3 whereas a 10 MeV proton has barely started gaining some energy in the same time interval. Dissert. Abstr.

N74-31230*# Columbia Univ., New York. Astrophysics Lab.
RESEARCH ON THE PROPERTIES AND INTERACTIONS OF SIMPLE ATOMIC AND IONIC SYSTEMS Final Technical Report, 1 Jan. 1963 - 31 Dec. 1972
R. Novick Aug. 1974 21 p refs
(Grant NGL-33-008-009)
(NASA-CR-139397; CAL-1263) Avail: NTIS HC $4.25 CSCL 20H

Research data, accompanied by abstracts, on properties and interactions of simple ionic atomic systems are reported. Abstracts are also given for miscellaneous studies on lifetimes of atomic states excited by polarized light, rocket studies of far ultraviolet radiation in auroras, time correlation in the detection of photon emission, frequency shifts in Rb-85 maser frequency standard, and vanishing dipole matrix elements at level crossings. E.H.W.

N74-31231# National Academy of Sciences - National Research Council, Washington, D.C.
USERS' GUIDES FOR RADIOACTIVITY STANDARDS
Feb. 1974 90 p refs Sponsored by AEC
(NAS-NS-3115) Avail: NTIS HC $3.00

A short guide to chemical and counting problems for standards that are in common use or are expected to be available is presented. The users' guides are prepared separately for every element. NSA

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-31232 California Univ., Los Angeles.
THE PONDEROMOTIVE FORCE EXERTED ON A PLASMA BY AN INFRARED LASER BEAM Ph.D. Thesis
Michel Edmond Marhic 1974 132 p
Avail: Univ. Microfilms Order No. 74-18786

The single-particle and continuum approaches to the ponderomotive force in an underdense plasma are presented and compared. The force density tends to expel the plasma radially out of a focused laser beam, and in the presence of a strong magnetic field the motion is one-dimensional. Transient and steady-state responses of the plasma to the ponderomotive force are studied using a one-fluid model, with the force being exerted on the electrons, and the inertia being provided by the ions. It is shown that large values of alpha can significantly modify the transient response of the plasma by either saturation or particle trapping in potential throughs. Dissert. Abstr.

N74-31233# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
LARGE ENTHALPY EXTRACTION EXPERIMENTS IN A NON-EQUILIBRIUM MAGNETOHYDRODYNAMIC GENERATOR
E. Tate, C. Marston, and B. Zauderer 29 Jul. 1974 13 p refs
(Doc-74SD226) Avail: NTIS HC $4.00

Experiments measuring the performance of a magnetohydrodynamic (MHD) generator are reported. The test gas used was cesium seed neon heated to a temperature of 3520 K in a shock tube. The power output was 1.82 megawatts, with a 19.3% enthalpy extraction. The MHD channel had an area ratio of six to one with seventy-one pairs of electrodes. Theoretical calculations show that if thermionically emitting electrodes were used, 30% enthalpy extraction could be obtained. M.C.F.

N74-31234# Cornell Univ., Ithaca, N.Y. Lab. of Plasma Studies.
FUNDAMENTAL STUDIES OF RAPID PLASMA HEATING BY COLLECTIVE INTERACTIONS, USING STRONG TURBULENCE AND RELATIVISTIC ELECTRON BEAMS Annual Progress Report, 1 Apr. 1973 - 31 Mar. 1974
R. Kribel, C. Ekdahl, P. Korn, and C. B. Wharton 1974 84 p refs
(Contract AT(11-1)-3165)
(COO-3165-6) Avail: NTIS HC $6.25

The experiments all involved rapid heating of a magnetically confined collisionless plasma column with a high-current relativistic electron beam (REB). The fully ionized plasma column was injected through a 5-cm orifice along magnetic lines into a hard vacuum in a 40-cm-diameter chamber, eliminating the effects of walls and neutral gas around the column. Thus the electron beam did not create plasma, but only interacted with the already-existing, finite column. Three distinct plasma conditions were used: (1) injected plasma having a temperature of tens of electron volts and density between 10 to the 13th power and 6 x 10 to the 13th power cm-3; (2) injected plasma heated to several keV by turbulent heating; and (3) highly turbulent plasma (electrostatic instabilities generated during turbulent heating). The strongest REB interaction was with plasma condition (3). Plasma heating to as much as 15 keV per electron-ion pair was achieved. The ion energy distribution was enhanced at high energies, with the ions containing 1/3 to 1/4 of the total plasma energy. The plasma was stable after heating. Author (NSA)

N74-31235# Nauchno-Issledovatelskij Inst. Ehlekt- Rofizicheskoj Apparatury, Leningrad (USSR).
EXPERIMENTAL INVESTIGATION OF INTERACTION PROCESSES OF INTENSE RELATIVISTIC ELECTRON FLOW IN A BEAM - PLASMA SYSTEM
T. S. Gosteva, G. R. Zablotskaya, B. A. Ivanov, and V. I. Chernobrovin 1973 12 p refs In RUSSIAN
(NP-19927) Avail: AEC Depository Libraries $3.00

The experiments were carried out using a high-current electron accelerator. The relativistic electron flow with a bunch energy of approximately 1 kJ, a maximum current value of 50 kA, and pulse duration of approximately 20 nsec was used in the experiment. Author (NSA)

N74-31236# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France).
BROADENING OF ATOMIC ABSORPTION LINES IN A PLASMA Ph.D. Thesis - Paris Univ.
M. Penicaud Jan. 1974 70 p refs In FRENCH
(CEA-R-4497) Avail: AEC Depository Libraries HC $5.50

A theory is presented using double-time, statistical Green functions where the full dynamical picture of all particle interactions is naturally incorporated. Doppler broadening appears automatically in the theory. The line profile for Lyman-alpha absorption is calculated via linear response theory. Interaction between the radiating atom and the perturber is treated without approximations. The calculated line profile is compared with the experimental data of Griem and Elton and it is seen that the behavior near the line center is fairly well reproduced. Broadening due to electrons alone is compared with the theory of Zaidi and some differences are noted. Further, a slight fluctuation of the line profile appears at a frequency separation from the line center equal to the electron plasma frequency. Author (NSA)

N74-31237# Michigan Univ., Ann Arbor. Dept. of Nuclear Engineering.
MICROINSTABILITIES IN INHOMOGENEOUS PLASMA Progress Report, 31 Jan. 1973 - 31 Jan. 1974
T. Kammash Jan. 1974 8 p refs
(Contract AT(11-1)-1478)
(COO-1478-12) Avail: NTIS HC $3.00

A number of investigations relevant to both confinement physics and reactor studies have been initiated or continued in the period since the last progress report. In terms of relevance to CTR research these problems are classified and discussed under three major categories: toroidal confinement, open-ended confinement, and reactor-related studies. In each case the important results obtained thus far are presented, and a brief

discussion of future work in the subject itself or in a related area is put forth. Author (NSA)

N74-31238# Oak Ridge National Lab., Tenn.
SUFFICIENT STABILITY CRITERIA FOR PLASMA EQUILIBRIA WITH TENSOR PRESSURE
G. O. Spies and D. B. Nelson Jan. 1974 54 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4452) Avail: NTIS HC $4.75

Sufficient stability criteria valid in all situations for which an energy principle holds are derived, vis. tensor or scalar pressure, collisionless or collisional dynamics, toroidal or openended geometry, conducting or insulating walls, closed or ergodic magnetic field lines. These criteria reduce to well-known ones in toroidal equilibria with scalar pressure. They are close to necessary criteria in low-beta equilibria, allowing for interchanges. Various well-known favorable properties (vis., good courvature, magnetic well, negative v double prime line-typing) are recovered by considering special classes of equilibria. But since none of these properties appears to be crucial in general, the present criteria are capable of yielding a variety of hitherto unknown stably confined equilibria. Author (NSA)

N74-31239# Japan Atomic Energy Research Inst., Tokyo.
EXPERIMENTAL OBSERVATION OF COLLISIONLESS DRIFT WAVES IN THE JAERI TOROIDAL HEXAPOLE (JFT-1)
T. Nagashima, H. Yamato, H. Ohtsuka, T. Shiina, and S. Tamura May 1973 24 p refs
(JAERI-M-5263) Avail: AEC Depository Libraries

An experimental study of low-frequency waves was made in a low Beta plasma of the JAERI toroidal hexapole with and without toroidal field. The observed waves are identified as density-toroidal field. The observed waves are identified as density-gradient-driven collisionless drift waves and the interpretation of their mode transitions of poloidal mode number is given by comparison of the experimental results with the results predicted from the linear theory of a slab geometry.
Author (NSA)

N74-31240# Japan Atomic Energy Research Inst., Tokyo.
ANALYSIS OF THE RELAXATION PHENOMENA IN NONEQUILIBRIUM MHD GENERATOR BY FOUR-TERMINAL NETWORK THEORY
H. Shirakata Mar. 1973 40 p refs In JAPANESE
(JAERI-M-5207) Avail: AEC Depository Libraries

By extending the method for two-dimensional analysis of the electrical characteristics of a nonequilibrium MHD generator using four-terminal network theory, the relaxation phenomena in a multielectrode generator was studied. It is possible by this technique to examine the relaxation phenomena in the multielectrode generator as a whole, which usually defies the conventional methods. Numerical calculations were made on the Faraday generator which has 32 electrode pairs and preionizers. The variations in electron density, electron temperature, and output current along the generator channel are evaluated, taking into consideration the effects of wall leakage current and electrothermal instability. Author (NSA)

N74-31241# Cornell Univ., Ithaca, N.Y.
APPLICATION OF QUASILINEAR THEORY TO THE CORNELL TURBULENT HEATING EXPERIMENTS Final Report
A. Mondelli Jun. 1973 126 p refs
(Contract AT(11-1)-2230)
(COO-2230-1) Avail: NTIS

Quasilinear theory was applied to the Cornell turbulent heating experiments with the inclusion to the actual external circuitry of the experiments in the model. The resulting set of coupled, first order, ordinary differential equations are integrated numerically by the Runge-Kutta-Gill technique. A one dimensional model with Maxwellian electrons and ions, assuming a current driven ion-acoustic instability as the heating mechanism, is employed. The observed high energy ion component is therefore excluded from the analysis. The computed current and voltage vs. time have several significant points of agreement with those in the experiments, including the spikey structure observed in the voltage traces and the premature quenching of the instability noted in the experiments. The computed final ion temperature is in reasonable agreement with the experimentally observed bulk ion temperature (excluding the high-energy ion tail).
Author (NSA)

N74-31242# Defence Research Establishment Valcartier (Quebec).
BEHAVIOR OF TURBULENT SCALES IN HYPERSONIC SPHERE WAVES
L. Sevigny and D. Heckman Nov. 1973 58 p refs
(Contract DAAH01-69-C-0921)
(AD-780339; DREV-R-696/73) Avail: NTIS CSCL 20/9

The behavior of macroscales associated with the charge density fluctuations in the turbulent wakes of hypersonic spheres has been investigated using both Langmuir electron probes and continuum electrostatic ion probes. When cylindrical Langmuir probes are operated under favourable conditions, theoretical analysis indicates that the statistics of the probe current fluctuations are representative of the statistics of the electron density fluctuations. Similar analysis for continuum ion probes indicates however that the statistics of the current fluctuations depend not only on the ion density fluctuations but are possibly also strongly influenced by correlation functions involving temperature or velocity fluctuations. (Modified author abstract)
GRA

N74-31243# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFRARED DIAGNOSTICS AND LASER-INTERFEROMETRIC METHODS IN THE GAS DYNAMICS OF HIGH TEMPERATURES
R. E. Soloukhin and Yu. A. Yakobi 24 May 1974 16 p refs Transl. into ENGLISH from Aerophysical Studies Collection of Scientific Papers Inst. of Theoretical and Applied Mechanics Siberian Dept., USSR Academy of Sci., Novosibirsk, 1972 p 27-32
(AD-780368; FTD-HT-23-941-74) Avail: NTIS CSCL 20/9

Infrared laser interferometry methods are discussed for studying the state of an ionized gas. Using an experimental apparatus composed of a CO2 laser and a Michaelson interferometry, profiles of electron concentration, plasma temperature, and absorption coefficients were found for pulsed plasmas.
F.O.S.

N74-31244# Innsbruck Univ. (Austria). Inst. for Theoretical Physics.
THE 17 YEARS PLASMA PHYSICS IN INNSBRUCK Bibliography, 1957 - 1973
Ferdinand Cap 15 Sep. 1973 47 p
(AD-780359; UNICP-SR-100) Avail: NTIS CSCL 20/9

In the report the results of 17 years (1957 1973) of research in Magnetohydrodynamics and Plasma Physics are summarized and reviewed. It also covers a summary lecture held by F. Cap in Julich, Germany, Plasma Physics Institute of the Kernforschungsanlage Julich on 14 September 1973. The following topics are discussed: MHD - theory of ideal plasma; MHD - theory of a finite conductive plasma; MHD - channel flow and accelerators; MHD - waves, shocks, characteristics; MHD - instabilities; mathematical methods; Vlasov - plasmas and echoes; microinstabilities; experimental plasma physics; space plasmas.
GRA

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-31245 British Library Lending Div., Boston Spa (England).
INSTABILITY OF A SMOOTH INTERFACE DURING THE GROWTH OF SINGLE CRYSTALS OF DECOMPOSING COMPOUNDS
O. V. Pelevin, B. G. Girich, B. D. Lainer, and M. G. Milvidskii 28 Dec. 1973 9 p refs Transl. into ENGLISH from 2d Conf. Proc., Rost Defekty Metal Krist Mater Vses Soveshch (Kiev), 1972 p 261-268
(BLL-RRE-Trans-421-(8036.625)) Avail: British Library Lending

Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The causes for instability of the smooth crystallization interface were investigated in gallium arsenide for the growth of doped, and undoped single crystals. It was found that during the growth of undoped single crystals, concentration supercooling arises due to the presence in the melt of an excess of one of the components; and in doped single crystals, the stability is related to the enrichment of the diffusion layer by the basic component and the doping impurity. F.O.S.

N74-31246 British Library Lending Div., Boston Spa (England).
EFFECT OF HYDROSTATIC PRESSURE ON SUBSTRUCTURE DEVELOPMENT DURING THE STRAINING OF FACE-CENTERED CUBIC LATTICE POLYCRYSTALS
V. I. Zaitsev, E. A. Pavlovskaya, and B. P. Filatov 4 Feb. 1974 9 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 18, 1973 p 854-858 In ENGLISH and RUSSIAN
(BLL-NEL-TT-2530-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The nature of the substructure development in austenitic alloys, lightly strained under a high hydrostatic pressure was investigated. In particular, an examination was made of the role of pressure as a physical factor, promoting the formation of an ordered cell like dislocation structure at low stains when the density of the dislocations in the body is still small. The Berg-Barrett and Weissmann methods were used to solve the problem. Author

N74-31247 British Library Lending Div., Boston Spa (England).
INVESTIGATIONS INTO IRON-DOPED TIN-OXIDE FILMS FOR CONTINUOUS SECONDARY ELECTRON MULTIPLIERS
G. Blasek 27 Feb. 1974 8 p refs Transl. into ENGLISH from Wiss. Z. Tech. Univ. Dresden (East Ger.), v. 21, no. 1, 1972 p 15-17
(BLL-Trans-885-(9022.64)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Iron (III) doped tin oxide films were prepared by the spray process. Their electrical resistance was investigated in air at normal pressure, and in high vacuum, as a function of temperature and time. Resistance values and uniformity are adequate for operation in a continuous secondary electron multiplier with a plane resistance film. The secondary electron emission capability was increased by vapour deposited Al2O3 film. Irreversible resistance variations occur only above 200 C. Author

N74-31248 British Library Lending Div., Boston Spa (England).
THE MEASUREMENT OF THE EQUIVALENT NOISE TEMPERATURE OF LIQUID NITROGEN COOLED NOISE SOURCE
Yoshihiko Kato, Takeyuki Ojima, and Chihiro Miki 10 Dec. 1973 12 p refs Transl. into ENGLISH from Bull. of the Combined Electron. Tech. Res. Inst. (Japan), v. 36, no. 7, 1972 p 559-565
(BLL-Trans-3036-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Results of the precision measurement of low-noise temperatures below 100K are reported. The noise source measured was a waveguide liquid-nitrogen-cooled noise source for the 4 GHz band. The possible measurement errors are analyzed. F.O.S.

N74-31249# Technische Hochschule, Hanover (West Germany).
STUDY OF THE INFLUENCE OF CRYSTAL ORIENTATION ON THE FAST SURFACE PROPERTIES OF n-GERMANIUM USING AN IMPROVED ARRANGEMENT FOR FIELD EFFECT MEASUREMENTS Ph.D. Thesis [UNTERSUCHUNG DES EINFLUSSES DER KRISTALLORIENTIERUNG AUF DIE SCHNELLEN OBERFLAECHENZUSTAENDE VON n-GERMANIUM MIT EINER VERBESSERTEN ANORDNUNG FUER FELDEFFEKTMESSUNGEN]
Gerhard Woltmann 1973 95 p refs In GERMAN
Avail: NTIS HC $7.75

Alternating voltage field effect measurements are periormed on n-germanium surfaces with crystal orientations (111), (110), and (100) by a field effect head in an ultrahigh vacuum environment. Results indicate that stress and lattice defects cause fast oscillations in the Ge04 hexagonal lattice structure. It is also shown that the hexagonal Ge04 lattice fits the (111) surface. The concentration of fast oscillations on the (110) surface is attributed to the larger density of surface atoms and their free bonds. Transl. by G.G.

N74-31250# Technische Universitaet, Munich (West Germany).
PHOTOELECTRON SPECTROSCOPY ON PURE POLAR GaAs(111) AND (-1-1-1) FACES TO PROVE SURFACE PROPERTIES AND FOR STUDYING OXIDATION BEHAVIOR Ph.D. Thesis [PHOTOELEKTRONEN-SPEKTROSKOPIE AN REINEN POLAREN GaAs(1-1-1)FLAECHEN ZUM NACHWEIS VON OBERFLAECHENZUSTAENDEN UND ZUM STUDIUM DES OXIDATIONSVERHALTENS]
Wolfgang Ranke 1973 136 p refs In GERMAN
Avail: NTIS HC $10.00

Auger electron spectra of GaAs surface structures show that direct optical transformations affect markedly electron excitation; polarized (111) surfaces emitt electrons whose crystal impulses are directed vertical to the surface. Electron emissions from band edges differ in both polar surfaces with a distribution on the pure Ga(111) plane up to 0.5 eV, and on the pure As(-1-1-1) plane up to 0.75 eV over the valence band boundary. Beginning oxidation does not change the ionization threshold of the As(-1-1-1) surface but increases that of the Ga(111) surface. Strong oxydation of heated probes increases ionization thresholds for both crystal surfaces. Crystal surface oxidation is markedly accelerated by electron bombardment. Transl. by G.G.

N74-31251# Technische Universitaet, Brunswick (West Germany).
THE OPTICAL CONSTANTS OF GERMANIUM DURING ELECTRON BEAM EXCITATION Ph.D. Thesis [DIE OPTISCHEN KONSTANTEN VON GERMANIUM UNTER ELEKTRONENSTRAHLANREGUNG]
Ulrich Barkow 2 Feb. 1973 96 p refs In GERMAN
Avail: NTIS HC $8.00

Intermittent electron beam irradiation of germanium increases density of injected free charge carriers and affects absorption as reflected in the optical constants n and k of the absorption and reflection spectra. Temperature modulation effects in the optical constants can be separated by the use of a phase sensitive rectifier. Transl. by G.G.

N74-31252# Elektronikcentralen, Hoersholm (Denmark).
TECHNOLOGICAL ASPECTS OF SEMICONDUCTOR COMPONENTS 1. CHEMICAL AND MECHANICAL DECAPSULATION TECHNIQUES: SIMPLE ANALYTICAL TECHNIQUES, INCLUDING MICROSCOPY, X-RAYS OR SCANNING OF BONDING STRENGTH, PRACTICAL EXAMPLES [TEKNOLOGISK VURDERING AF HALVLEDERKOMPONENTER 1. KEMISK OG MEKANISK DISSEKERINGSTEK-NIK: INDLEDENDE ANALYSETEKNIK, HERUNDER MIKROSKOPI, RONTGEN OG MALING AF BONDINGTRAEKSTYRKER, PRAKTISKE EKSEMPLER]
P. Villien Apr. 1974 91 p In DANISH; ENGLISH summary
(ECR-40) Avail: NTIS HC $7.75

Analytical procedures were impleminted to evaluate methods for chemical and mechanical decapsulation without damage to any part of the components. Furthermore it was the intention to evaluate and describe simple and fast methods for quality evaluations of semiconductor devices, including X-ray analysis, optical microscopy and scanning electron microscopy. The largest part of the data concerns chemical decapsulation methods for plastic encapsulated components, but methods were evaluated for stripping of glass encapsulations, ceramic housings, metal housings and combined ceramic/metal encapsulations. Advantages and disadvantages of different optical microscopes were discussed. In the X-ray section some examples are represented of photographs of different component categories. There is a section discussing bonding strength measurement as a basis for evaluation of bonding quality. Author

N74-31253*# Alabama Univ., University.
INVESTIGATION OF CRYSTAL GROWTH FROM SOLUTIONS Progress Report, 22 May - 21 Jul. 1974
Ichiro Miyagawa 7 Aug. 1974 23 p refs
(Contract NAS8-28098)
(NASA-CR-120380) Avail: NTIS HC $4.25 CSCL 20L

The quality was investigated of a crystal of Rochelle salt

grown from a solution placed in the zero-gravity environment of Skylab 4. The crystal has the following unique features: (1) the typical cavity is a long tube extending along the c-axis, the average length being 4mm, compared to 0.1mm that is the average size for earth-grown crystals; and (2) the crystal consists of several single crystals, the axes of which are parallel to each other. A preliminary measurement was made on the ferroelectric hysteresis curve of this Rochelle salt crystal. Author

N74-31254# Addis Translations International, Woodside, Calif.
PHOTOSENSITIZED ELECTROLYTIC OXIDATION AT A TiO2 SEMICONDUCTOR ELECTRODE
A. Fujishima, K. Honda, and S. Kukuchi Jan. 1974 25 p refs Transl. into ENGLISH from Kogyo Kagaku Zasshi (Japan), no. 72, 1969 p 108-113 Prepared for Sandia Labs., Albuquerque, N. Mex. Sponsored by AEC
(SLA-74-6008) Avail: NTIS HC $3.25

Measurements were carried out on polarization behavior with TiO2 (rutile), an n-type semiconductor, as an electrode. In the absence of irradiation, hydrogen evolution took place under cathodic polarization, and there was a pronounced electrolytic rectification phenomenon accompanied by a very low current under anodic polarization. Irradiation of the surface of the TiO2 electrode with light had no effect on the cathodic current, but greatly increased the anodic current. This current flow was produced only by irradiation with light of wavelength 415 microns or less (corresponding to the TiO2 band-gap 3.0 eV), and was proportional of the intensity of the light. The rise potential was measured as 0.5 eV (vs. Standard Calomel Electrode (SCE) at pH 4.7). The electrolytic reaction was confirmed to be evolution of oxygen due to electrolysis of water, and not dissolution of the electrode itself as has been reported for n-type semiconductors. This oxygen evolution, occurring at potentials about 1 V lower than the equilibrium potential, is called photosensitized electrolytic oxidation, and occurs as a result of absorption of the light energy by the semiconductor. It was also confirmed that the oxidation I(-) to I2 took place at potentials lower than the equilibrium potential. The mechanism is discussed with the aid of band model for semiconductors. Author (NSA)

N74-31255# Argonne National Lab., Ill.
SYMMETRY PROPERTIES OF THE LATTICE DYNAMICS OF TWENTY-THREE CRYSTALS
J. L. Warren and T. G. Worlton Dec. 1973 535 p refs Prepared in cooperation with Los Alamos Scientific Lab.
(Contract W-31-109-eng-38)
(ANL-8053; LA-5465-MS) Avail: NTIS HC $13.60

Symmetry properties of the lattice vibrations of crystals are widely used in analyzing the results of various experiments such as neutron inelastic scattering measurements. This greatly reduces the work involved in this analysis, but application of the group theoretical methods is also quite tedious, particularly the determination of the symmetry reduced form of the dynamical matrix, and determination of the symmetry coordinates which block diagonalize that matrix. A program was written to do this analysis, and results are presented for 23 common crystals. The first five sections contain a discussion of the computer output and pertinent references. The remainder of the report contains the actual computer output plus drawings of the Brillouin zones of the crystals analyzed. NSA

N74-31256# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
METHOD OF COLOR SYMMETRY AND THE THEORY OF REPRESENTATION GROUPS IN MAGNETIC CRYSTAL PHYSICS. 1. THE MAGNETIC INTERPRETATION OF THE BELOV (POLYCHROMATIC) SPACE GROUPS
V. A. Koptsik, I. N. Kotsev, and Zh. N. M. Kuzhukeev 1973 16 p refs In RUSSIAN
(JINR-P4-7514) Avail: AEC Depository Libraries HC $3.00

The magnetic interpretation of the Belov (polychromatic) space groups is presented. These groups allow a more complete description of the symmetry of the stationary magnetic structures in crystals. Author (NSA)

N74-31257# Atomic Energy Commission, Oak Ridge, Tenn. Technical Information Center.
PROBLEMS ON DEVELOPMENT OF SUPERCONDUCTING POWER TRANSMISSION LINES
N. T. Bendik and E. L. Blinkov, ed. 1973 36 p refs Transl. into ENGLISH from Probl. Sozdaniya Sverkhprovodyashchikh Liniy (Moscow), 1973 36 p
(AEC-tr-7509) Avail: NTIS HC $4.00

The problems in the development of superconducting power transmission lines and their solutions are presented. The following specific topics are considered: (1) analysis of electromagnetic, thermophysical, and hydrodynamic processes that take place in power transmission lines; (2) cryogenic high-voltage insulation, basic requirements on insulation constructions, the types of cryogenic insulation, the advantages of coolant and vacuum as the basic insulation, and the scientific research program on high-voltage insulation; (3) properties of superconducting ac cable (SCC) lines that are largely determined by their transmitting capacity; (4) features of heat exchange and hydrodynamics of SCC; (5) character of pulsation modes and conditions under which they occur; and (6) developing superconducting cables, the problems of measuring the parameters of SCC, automation of measurements, and control, regulation, and safety. NSA

N74-31258# Sperry Rand Research Center, Sudbury, Mass.
FERROELECTRIC BISMUTH TITANATE SINGLE CRYSTALS Final Report, 15 May 1972 - 15 Nov. 1973
M. Kestigian Feb. 1974 39 p refs
(Contract F33615-72-C-1827; AF Proj. 4150)
(AD-779012; SCRC-CR-73-11; AFAL-TR-74-15) Avail: NTIS CSCL 20/2

Investigations carried out and the results obtained during an eighteen month program on ferroelectric bismuth titanate single crystal growth are described. Single crystal growth techniques studied included horizontal and vertical gradient high temperature solution, Czochralski direct melt, top-seeded and immersed seeded solution experiments. Effects of raw material purity and the incorporation of known and controlled cations on the growth and morphology of Bi4Ti3O12 single crystals were examined. (Modified author abstract) GRA

N74-31259# California Univ., Irvine. Dept. of Physics.
INCOMPATIBILITY OF BCS PAIRING AND THE PEIERLS DISTORTION IN LINEAR CHAIN SYSTEMS Final Report
K. Levin, D. L. Mills, and S. L. Cunningham Nov. 1973 14 p refs
(Contract N00014-69-A-0200-9003; Grant AF-AFOSR-2018-71; NR Proj. 015-731)
(AD-780459; TR-73-74) Avail: NTIS CSCL 20/12

The authors have solved the coupled gap equations for a one-dimensional electron gas which can undergo both a Peierls insulating and a BCS superconducting transition. It is found that, except for a very special case, (1) only one of the order parameters can be non-vanishing and (2) there is only one critical temperature. It is concluded that, independent of the pairing interaction strength, if the Peierls transistion occurs, there can be no BCS superconductivity, and conversely. Author (GRA)

N74-31260# Illinois Univ., Urbana. Coordinated Science Lab.
PHOTOLUMINESCENCE AND ANNEALING OF THE IMPLANTED NITROGEN ISOELECTRONIC TRAP IN GaAs(1-x)P(x)
Donald James Wolford, Jr. Dec. 1973 115 p refs
(Contract DAAB07-72-C-0259)
(AD-774319/8; UILU-ENG-73-2240; R-636) Avail: NTIS HC $4.50 CSCL 20/12

The goal of the investigation was to establish through photoluminescence the presence of the optically-active N isoelectronic trap in GaAs(1-x)Px following 14N(+)implantations. Study of annealing and damage associated non-radiative centers as a function of implantation fluence, substrate temperature, and material composition were explored. Photoluminescence data confirming optically active N trap incorporation is presented for two GaAs(1-x)Px compositions (x = 0.50, x = 0.37) on either side of the direct-indirect crossover. GRA

N74-31261# Isomet Corp., Oakland, N.J.
CESIUM DIDEUTERIUM ARSENATE CRYSTAL DEVELOPMENT Final Report, 1 Mar. 1973 - 31 Mar. 1974
Joseph F. Balascio and Gabriel M. Loiacono 20 Apr. 1974 71 p refs

(Contract N00014-73-C-0372)
(AD-780247; TR-134) Avail: NTIS CSCL 20/2

The results on the growth of cesium dideuterium arsenate from aqueous and mixed solvent systems are reported. Particular emphasis had been placed on the analyses of the factors affecting the solution chemistry of CD^*A and their affect upon the resultant growth. The phase stability, solubility and supersaturation of CD^*A were determined in both solvent systems. Actual deuteration levels in the crystal and aqueous growth solution are reported and discussed. Preliminary data show the mixed solvent system to be very promising for the reproducible growth of high optical quality CD^*A. Author (GRA)

N74-31262# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH, 1974:1 Quarterly Technical Summary, 1 Nov. 1973 - 31 Jan. 1974
Alan L. McWhorter 15 Feb. 1974 86 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-779823; ESD-TR-74-38) Avail: NTIS CSCL 20/12

The report covers in detail the solid state research work of the solid state division at Lincoln Laboratory for the period 1 November 1973 through 31 January 1974. The topics covered are solid state device research, quantum electronics, materials research, physics of solids, and microelectronics. The microsound work is sponsored by ABMDA and is reported under that program. Author (GRA)

N74-31263# Illinois Univ., Urbana. Dept. of Electrical Engineering.
RESEARCH ON SEMICONDUCTORS AND TRANSISTOR ELECTRONICS Final Report, 16 Sep. 1967 - 15 Sep. 1973
Paul Handler May 1974 6 p refs
(Contract N00014-67-A-0305-0011)
(AD-779869; UILU-ENG-74-2545) Avail: NTIS CSCL 20/12

The areas of research have been mainly surface physics of semiconductor surfaces. The original direction of the research was directed toward space charge layers and the role of surface states on oxide covered and atomically clean surfaces in vacuum. Later on interest and techniques changed so that the major field of interest was the band structure of germanium silicon and gallium arsenide using the space charge region modulation techniques developed by this laboratory and others over the past decade. The contribution to the field of solid state electronics during the period of ONR support under this contract as well as previous ones is shown by the list of publications which follows this page. The publication titles show the diversity of subjects covered as well as the names of the personnel who have worked on this contract. GRA

N74-31264# American Museum of Natural History, New York. Dept. of Animal Behavior.
AMPLIFICATION BY INJECTION LOCKING OF A JOSEPHSON OSCILLATOR
Charles V. Stancampiano Apr. 1974 18 p refs
(Contract N00014-67-A-0398-0003; NR Proj. 121-111)
(AD-779893) Avail: NTIS CSCL 20/12

Josephson oscillations near 9 GHz, produced by a point-contact junction mounted in a coaxial resonator and biased onto the cavity-induced step in its V-I curve, have been pulled in frequency and phase locked by a weak injected signal at a nearby frequency. The resulting output was at the signal frequency and had the narrow bandwidth and frequency stability of the input but the power level of the Josephson oscillations. Maximum gain of 51db was achieved for an input of 10 to the minus 16th power W. Author (GRA)

N74-30952* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MOSSBAUER EFFECT AND ITS APPLICATIONS IN MATERIALS RESEARCH
Jag. J. Singh *In its* Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 19 p refs (For availability see N74-30922 20-18)
CSCL 20L

N74-31157 Army Electronics Command, Fort Monmouth, N.J.
STATE OF THE ART: QUARTZ CRYSTAL UNITS AND OSCILLATORS, PART A. PROGRESS IN THE DEVELOPMENT OF QUARTZ CRYSTAL UNITS AND OSCILLATORS SINCE 1966, PART B
Edvard A. Gerber and Roger A. Skyes *In* NBS Time and Freq. May 1974 p 41-64 refs (For availability see N74-31155 20-23)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-31265 British Library Lending Div., Boston Spa (England).
CONTRIBUTION TO THE GAS CHROMATOGRAPHIC ANALYSIS OF PROPELLANTS
A. Sopranetti and H. U. Reich 4 Feb. 1974 18 p refs Transl. into ENGLISH from Explosivstoffe (East Germany), v. 20, no. 11-12 1972 p 197-202
(BLL-DRIC-Trans-3201-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A method is described for the quantitative determination by gas chromatography of nitroglycerine and other extractable components of propellants. Reproducibility and absolute accuracy are checked by thorough examination and the analytical versatility of the method is demonstrated. Packed columns are used for the separation by gas chromatography. A good selectivity with short retention times is achieved by low coating of the support with stationary phases that are adapted exactly in their polarity. In three examples the quantitative determination is given of combinations of the following substances: nitroglycerin, diphenylamine, 2-nitro-diphenylamine, ethyl-centralite, triacetin, resorcin, methyl-phenyl-urethane, 2-4-nitro-toluene and dibutyl-phtalate. In all analyses the standard-deviations remain below 2.5%. Author

N74-31266*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
STUDY OF CRYOGENIC PROPELLANT SYSTEMS FOR LOADING THE SPACE SHUTTLE Interim Report
R. O. Voth, W. G. Steward, and W. J. Hall Apr. 1974 94 p refs
(NASA Order CC-03420-A; NBS Proj. 2750458)
(NASA-CR-139441; NBSIR-74-366) Avail: NTIS HC $7.75 CSCL 21I

Computer programs were written to model the liquid oxygen loading system for the space shuttle. The programs allow selection of input data through graphic displays which schematically depict the part of the system being modeled. The computed output is also displayed in the form of graphs and printed messages. Any one of six computation options may be selected. The first four of these pertain to thermal stresses, pressure surges, cooldown times, flow rates and pressures during cooldown. Options five and six deal with possible water hammer effects due to closing of valves, steady flow and transient response to changes in operating conditions after cooldown. Procedures are given for operation of the graphic display unit and minicomputer. Author

N74-31267# Naval Postgraduate School, Monterey, Calif.
NATURAL FREQUENCIES OF BONDED AND UNBONDED PROPELLANTS IN THREE AND FIVE INCH ROCKET MOTORS Interim Report, Apr. - Jun. 1973
Robert E. Ball 16 May 1974 27 p refs
(AD-780219; NPS-55Bp74051) Avail: NTIS CSCL 21/9

The results of an analysis by Armenakas for the natural frequencies of composite (two material) cylinders is used to determine the lowest natural frequency of bonded and unbonded propellants in three-inch and five-inch rocket motors. The lowest frequency is found to be approximately eight times larger than the lowest frequency in the launch force pulse. Thus, the dynamic effects in the propellant will be significant. Author (GRA)

N74-31268# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
DEVELOPMENT OF HTPB PROPELLANT FOR BALLISTIC MISSILES Quarterly Progress Report, Jan. - Mar 1974
Grant Thompson and Even E. Day Apr. 1974 47 p

(Contract F04611-72-C-0048)
(AD-779817; TWR-74249; AFRPL-TR-74-20; QPR-8) Avail: NTIS CSCL 21/9

The program objective is to develop a family of solid propellants based on HTPB (hydroxyl terminated polybutadiene) binder, and demonstrate one optimized propellant formulation by large scale motor testing. Phase I data on DL-H271, an analog of TP-H1136, showed exceptionally fine structural properties after 27 months of aging at 75 and 135F. Additional data is presented for Phase II aging. The TU775/03 structural test vehicle was instrumented and cast with TP-H1139 propellant. Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-31269* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPUTTERING HOLES WITH ION BEAMLETS **Patent**

David C. Byers and Bruce A. Banks inventors (to NASA) 30 Jul. 1974 2 p Filed 27 Sep. 1972 Supersedes N72-32760 (10 - 23, p 3132) NASA-Case-LEW-11646-1; US-Patent-3,826,729; US-Patent-Appl-SN-292686; US-Patent-Class-204-192) Avail: US Patent Office CSCL 21C

Ion beamlets of predetermined configurations are formed by shaped apertures in the screen grid of an ion thruster having a double grid accelerator system. A plate is placed downstream from the screen grid holes and attached to the accelerator grid. When the ion thruster is operated holes having the configuration of the beamlets formed by the screen grid are sputtered through the plate at the accelerator grid.
Official Gazette of the U.S. Patent Office

N74-31270* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VARIABLY POSITIONED GUIDE VANES FOR AERODYNAMIC CHOKING **Patent**
David Chestnutt, inventor (to NASA) Issued 13 Aug. 1974 8 p Filed 27 Jun. 1972 Supersedes N72-27820 (10 - 18, p 2479
(NASA-Case-LAR-10642-1; US-Patent-3,829,237; US-Patent-Appl-SN-266820; US-Patent-Class-415-181; US-Patent-Class-137-15.1) Avail: US Patent Office CSCL 21E

A choking device to cause a sonic barrier to be formed which reduces the transmission of noise in a direction opposed to the direction of air flow in a compressor that may be part of an aircraft gas turbine engine is described. The noise reduction is accomplished by proper shaping and movement of inlet guide vanes, and an actuator is connected to selected guide vanes to effect movement by programmed amounts as required to choke or partially choke within the design range of the axial-flow-air compressor. Official Gazette of the U.S. Patent Office

N74-31271 New York Univ., N.Y. School of Engineering and Science.
DESIGN AND THEORETICAL PERFORMANCE ESTIMATE OF A THREE DIMENSIONAL INTEGRATED SCRAMJET ENGINE **Ph.D. Thesis**
Anthony Michael Agnone 1973 607 p
Avail: Univ. Microfilms Order No. 73-28541

The design and theoretical performance estimates of an integrated three-dimensional fixed geometry scramjet engine are presented. The engine is designed to propel a large vehicle with a take-off weight on the order of one million pounds. Therefore, the mutual interaction effects of the vehicle aerodynamic forces and the propulsive forces are investigated first to determine an efficient integrated system and to reduce the trim requirements on the over-all system. The individual components aerodynamic design of the scramjet engine, such as inlet, combustor, (and fuel injector), and nozzle are presented. Theoretical analysis of the various flow regions encountered in the engine are made to determine the individual performances. Extensive use of available analytical tools and wherever possible experimental data is relied upon to determine the physical constant in the various analyses. Dissert. Abstr.

N74-31272*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TERMINAL-SHOCK AND RESTART CONTROL OF A MACH 2.5, MIXED COMPRESSION INLET COUPLED TO A TURBOFAN ENGINE
Robert J. Baumbick, Peter G. Batterton, and Carl J. Daniele Washington Aug. 1974 18 p refs
(NASA-TM-X-3104; E-7924) Avail: NTIS HC $3.00 CSCL 21E

Results of an experimental program conducted on a mixed-compression inlet coupled to a turbofan engine are presented. Open-loop frequency response data are presented that show the response of shock position (as measured by an average inlet static pressure) to sinusoidal airflow disturbances produced at the compressor face station. Also presented are results showing the effect of different passive terminations (a choke plate or a long duct) on the characteristics of the inlet. Transfer functions obtained by using experimental data are presented and compared to the experimental data. Closed-loop frequency response of shock position (with a proportional-plus-integral controller) is presented. In addition, transient data are presented that show the unstart-restart characteristics of the inlet. Author

N74-31273# Technische Hochschule, Hanover (West Germany).
THE EFFECT OF HELIUM-NEON, HELIUM-NITROGEN, AND HELIUM-CARBON GAS MIXTURES ON ENCLOSED GAS TURBINE SYSTEMS **Ph.D. Thesis** **[DER EINFLUSS DER GASMISCHUNGEN HELIUM-NEON, HELIUM-STICKSTOFF UND HELIUM-KOHLENDIOXID AUF GESCHLOSSENE GASTURBINENANLAGEN]**
Rudiger Klein 1973 251 p refs In GERMAN
Avail: NTIS HC $15.75

The effects of helium mixtures with neon, nitrogen, and carbon dioxide on the design of enclosed gas turbines are calculated by considering the real behavior of the gas mixtures in forming corresponding equations. Results show that the use of gas mixtures reduces development and operational costs relatively to the increased molecular weight of the working gas mixture. A helium carbon dioxide mixture represents the most cost effective working medium for the enclosed gas turbine. Transl. by G.G.

N74-31274*# General Electric Co., Cincinnati, Ohio.
ADVANCED SUPERSONIC TECHNOLOGY PROPULSION SYSTEM STUDY **Final Report**
R. Szeliga and R. D. Allan Jul. 1974 179 p
(Contract NAS3-16950)
(NASA-CR-143634; R74AEG330) Avail: NTIS HC$12.00 CSCL 21A

This study had the objectives of determining the most promising conventional and variable cycle engine types: the effect of design cruise Mach number (2.2, 2.7 and 3.2) on a commercial supersonic transport; effect of advanced engine technology on the choice of engine cycle; and effect of utilizing hydrogen as the engine fuel. The technology required for the engines was defined, and the levels of development to ensure availability of this technology in advanced aircraft propulsion systems were assessed. No clearcut best conventional or variable cycle engine was identified. The dry bypass turbojet and the duct burning turbofans were initially selected as the best conventional engines, but later results, utilizing augmentation at takeoff, added the mixed-flow augmented turbofan as a promising contender. The modulating air flow, three-rotor variable cycle engine identified the performance features desired from VCE concepts (elimination of inlet drag and reduction in afterbody drag), but was a very heavy and complex engine. Author

N74-31275# Rockwell International Corp., Canoga Park, Calif.
DOWN-TO-EARTH APPLICATIONS OF ROCKET ENGINE TECHNOLOGY
[1973] 14 p

Avail: NTIS HC $4.00

The transfer of technology from the space programs to the commercial applications is discussed. The contribution of the rocket industry in the form of a nonpolluting engine for generating electricity and a waterjet propulsion system for driving high speed boats is described. The development and characteristics of a copper alloy, NARLOY-Z, are reported. Photographs and drawings of the space technology products are provided. Author

N74-31276*# Rocketdyne, McGregor, Tex.
SPACE SHUTTLE MANEUVERING ENGINE REUSABLE THRUST CHAMBER PROGRAM. TASK 11: LOW EPSILON STABILITY TEST PLAN
R. P. Pauckert 1974 15 p
(Contract NAS9-12802)
(NASA-CR-134359; ASR74-204) Avail: NTIS HC $4.00 CSCL 21H

The performance and heat transfer characteristics of a doublet element type injector for the space shuttle orbiter maneuvering engine thrust chamber were investigated. Ths stability characteristics were evaluated over a range of chamber pressures and mixture ratios. The specific objectives of the test were: (1) to determine whether stability has been influenced by injection of bloundary layer coolant across the cavity entrance, (2) if the injector is stable, to determine the minimum cavity area required to maintain stability, and (3) if the injector is unstable, to determine the effects of entrance geometry and increased area on stability. Author

N74-31277*# Aerojet Liquid Rocket Co., Sacramento, Calif.
EXTENDED TEMPERATURE RANGE ACPS THRUSTER INVESTIGATION Final Report
A. L. Blubaugh and L. Schoenman 1 Aug. 1974 201 p refs
(Contract NAS3-16775)
(NASA-CR-134655) Avail: NTIS HC $13.25 CSCL 21H

The successful hot fire demonstration of a pulsing liquid hydrogen/liquid oxygen and gaseous hydrogen/liquid oxygen attitude control propulsion system thruster is described. The test was the result of research to develop a simple, lightweight, and high performance reaction control system without the traditional requirements for extensive periods of engine thermal conditioning, or the use of complex equipment to convert both liquid propellants to gas prior to delivery to the engine. Significant departures from conventional injector design practice were employed to achieve an operable design. The work discussed includes thermal and injector manifold priming analyses, subscale injector chilldown tests, and 168 full scale and 550 N (1250 lbF) rocket engine tests. Ignition experiments, at propellant temperatures ranging from cryogenic to ambient, led to the generation of a universal spark ignition system which can reliably ignite an engine when supplied with liquid, two phase, or gaseous propellants. Electrical power requirements for spark igniter are very low. Author

N74-31278# Nauchno-Issledouatelskij Inst. Atomnykh Reaktororov, Dimitrovgrad (USSR).
TESTING THE PERFORMANCE OF DKM-6 ENGINES UNDER IRRADIATION
N. A. Aseev, N. P. Losev, B. V. Samsonov, and V. A. Tsykanov 1973 36 p refs In RUSSIAN
(SRARI-P-184) Avail: AEC Depository Libraries HC $4.00

The results are presented on experimental testing of the performance of two DKM-6 engines in the flux of mixed radiation of various intensities. The engines were irradiated in one of SM-2 reactor channels during intermittent engine operation. The experimental methods to provide the required temperatures and measurements of the electrical characteristics are presented. It is shown that the integrated doses of 4.63 x 10 to the 17th power fast neutrons/sq cm 5 48 X 10 to the 18th power thermal neutron/sq cm and 5 x 10 to the 10th power rad of fast neutrons, thermal neutrons and gamma radiation, respectively, are close to maximum permissible doses for engines of this design both in relation to the state of electrical insulation materials and to that of a special material for bearings with solid lubrication. Author (NSA)

N74-31279# AiResearch Mfg. Co., Phoenix, Ariz.
ADVANCED, SMALL, HIGH-TEMPERATURE-RISE COMBUSTOR PROGRAM. VOLUME 2: DESIGN AND TEST OF FULL-SCALE COMBUSTION SYSTEM Final Report
Michael P. Wood and K. M. Johansen Feb. 1974 117 p refs
(Contract DAAJ02-70-C-0060; DA Proj. 1G1-62203-D-144)
(AD-776978; USAAMRDL-TR-74-3B) Avail: NTIS CSCL 21/5

The report describes an analytical and experimental study of advanced, small, high-temperature combustors. This volume describes the third and final phase of this program which included the design and performance verification tests of a full-scale combustion system. The objectives of the 32-month program were to develop and validate an analytical design technique for small, high-temperature-rise, low-airflow combustors and related components, and to define the limitations associated with these small combustors and related components and the effects of these limitations on the cycle and the configuration of advanced-technology engines. (Modified author abstract) GRA

N74-31280# Teledyne CAE, Toledo, Ohio.
ADVANCED SMALL AXIAL TURBINE TECHNOLOGY PROGRAM, PHASE 2 Test Report, 1 Oct. 1972 - 20 Dec. 1973
Hans F. Due and Casmir Rogo Feb. 1974 166 p refs
(Contract DAAJ02-72-C-0117)
(AD-780152; TCAE-1329) Avail: NTIS CSCL 21/5

The report presents the Phase II experimental investigations of the Phase I turbine design aerodynamics accomplished using a non-rotating, annular sector cascade. Phase II is the second phase of a five-phase thirty-one month program. The overall program is arranged to isolate the variables which affect turbine flow, and to develop both empirical data and design judgment criteria which can be incorporated into isolate the variables which affect turbine flow, and to develop both empirical data and design judgment criteria which can be incorporated into the design technique to improve the accuracy of predicting losses, flow conditions, velocity triangles and design point matching. (Modified author abstract) GRA

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-31281 California Univ., Los Angeles.
A SEARCH FOR THE SOLAR WIND IN THE LUNAR SOIL Ph.D. Thesis
Patrick Herbert Payton 1974 159 p
Avail: Univ. Microfilms Order No. 74-18799

Calculations are presented for the contribution of the solar wind to the elemental abundances in the surface layer of the lunar soil particles. Some theoretical aspects of the solar wind interaction with the lunar surface are considered. Results are presented from the analysis of lunar soil utilizing the trace analytical techniques of cyclotron produced high energy proton induced X-ray emission spectroscopy, high energy photon activation analysis, and flameless atomic absorption spectroscopy. Dissert. Abstr.

N74-31282 Ohio State Univ., Columbus.
THE EVOLUTION OF SOLAR ACTIVE REGIONS Ph.D. Thesis
Ray Napoleon Moses, Jr. 1974 171 p
Avail: Univ. Microfilms Order No. 74-17795

The evolution of solar active regions results from the motions of magnetic field elements. The motion of these field elements is treated using an analogy with the behavior of a two dimensional compressible gas (shallow water theory). The evolution of an active region is analogous to the creation of two moving sources during the Arch Filament System (AFS) phase and the flow of field elements from these sources, leading to disturbances which steepen into shock-like features. Two kinds of shocks exist: those within unipolar regions (moats) and those between unipolar regions of opposite polarity (prominences). Some observations associated with the evolution of active regions were: (1) flares and sudden disappearances of prominences are often

induced by a disturbance propagating from AFS at about one km/sec; (2) supergranule cell lifetimes rise in active regions; and (3) prominences are more probable on the upstream side of unipolar regions. Dissert. Abstr.

N74-31283*# Linguistic Systems, Inc., Cambridge, Mass.
NEW DATA ON COSMIC RAYS
G. B. Zhdanov Washington NASA Aug. 1974 73 p Transl. into ENGLISH of the book "Novyye Dannyye o Kosmicheskikh Luchakh" Moscow, Znaniye Press, no. 1, 1974 p 1-64
(Contract NASw-2482)
(NASA-TT-F-15619) Avail: NTIS HC $6.75 CSCL 03B

Successes in optical, radio-wave, and ultra-short-wave astronomy have made it possible to define the diverse role which is played in the universe by high energy processes that occur in stars and nuclei of galactic star systems. Streams formed as a result of these processes of atomic nuclei and electrons accelerated to colossal energies are registered in outer space near the earth in the form of cosmic rays. Author

N74-31284*# Stanford Univ., Calif. Inst. for Plasma Research.
THE SPIRAL INTERPLANETARY MAGNETIC FIELD: A POLARITY AND SUNSPOT CYCLE VARIATION
Leif Svalgaard and John M. Wilcox Jun. 1974 11 p refs Submitted for publication
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-31138)
(NASA-CR-139499; SU-IPR-573) Avail: NTIS HC $4.00 CSCL 03B

Spacecraft observations near the earth of the yearly average direction of the interplanetary magnetic field during the sunspot maximum year 1968 showed a deviation from the spiral field. The angle between the average field direction when the field polarity was away from the sun and the average direction for toward polarity was 168 deg, rather than 180 deg. This effect appears to have a sunspot cycle variation. Author

N74-31285*# Stanford Univ., Calif. Inst. for Plasma Research.
SOLAR ROTATING MAGNETIC DIPOLE?
Ester Antonucci Apr. 1974 28 p refs Submitted for publication
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; NSF GA-31138)
(NASA-CR-139501; SU-IPR-570) Avail: NTIS HC $4.50 CSCL 03B

A magnetic dipole rotating around an axis perpendicular to the rotation axis of the sun can account for the characteristics of the surface large-scale solar magnetic fields through the solar cycle. The polarity patterns of the interplanetary magnetic field, predictable from this model, agree with the observed interplanetary magnetic sector structure. Author

N74-31286*# Stanford Univ., Calif. Inst. for Plasma Research.
SOLAR CYCLE VARIATION OF LARGE-SCALE CORONAL STRUCTURES
Ester Antonucci and Thomas L. Duvall Apr. 1974 19 p refs Submitted for publication
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-31138)
(NASA-CR-139500; SU-IPR-569) Avail: NTIS HC $4.00 CSCL 03B

A green line intensity variation is associated with the interplanetary and photospheric magnetic sector structure. This effect depends on the solar cycle and occurs with the same amplitude in the latitude range 60 deg N - 60 deg S. Extended longitudinal coronal structures are suggested, which indicate the existence of closed magnetic field lines over the neutral line, separating adjacent regions of opposite polarities on the photospheric surface. Author

N74-31287*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RADIAL GRADIENT OF SOLAR WIND VELOCITY FROM 1 TO 5 AU
H. R. Collard and J. H. Wolfe Jun. 1974 17 p refs
(NASA-TM-X-62372) Avail: NTIS HC $3.00 CSCL 03B

Solar wind velocities have been measured on a daily basis from data obtained by the Ames Research Center plasma analyzers on both Pioneer 10 and Pioneer 11. A comparison between the time profiles of the solar wind velocities observed at the two spacecraft shows that the solar wind has the same major features, such as high velocity streams, out to at least 5 Astronomical Units (AU) from the sun. Major features in the velocity time profile observed first at Pioneer 11 are seen later at Pioneer 10 with a delay consistent with the respective heliocentric longitudes of the two spacecraft, their radial distances from the sun, and the solar wind velocity. A more detailed comparison between the velocity measurements made at Pioneer 10 and Pioneer 11 shows that the range of solar wind velocities decreases with increasing radial distance from the sun. Although the average value of the solar wind velocity as measured over a sufficiently long period is approximately the same at both spacecraft, the deviations to higher and lower velocities are less at a greater radial distance from the sun. Author

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-31288 Maryland Univ., College Park.
ON THE Io-MODULATED JOVIAN DECAMETRIC RADIATION Ph.D. Thesis
Robert Alan Smith 1973 228 p
Avail: Univ. Microfilms Order No. 74-16577

The emission and propagation of Io-induced decametric radio emission in the inner plasmasphere of Jupiter was examined. Very short-wavelength, quasi-electrostatic waves, with frequency near the local electron cyclotron frequency, are amplified by a collective plasma instability driven by the drift current associated with a steep density gradient of energetic particles at the walls of the flux tube threading Io; the density gradient is produced by the sweeping effect of Io, which is assumed to be only a moderately conducting body. Dissert. Abstr.

N74-31289 California Inst. of Tech., Pasadena.
APERTURE SYNTHESIS OBSERVATIONS OF OH ABSORPTION IN THE GALACTIC CENTER Ph.D. Thesis
John Harold Bieging 1974 187 p
Avail: Univ. Microfilms Order No. 74-17938

The galactic center radio sources Sgr A and Sgr B2 were mapped, by an aperture synthesis technique, in the 1667 MHz absorption line of the OH molecule. The angular resolution of the maps is 3:25, and the velocity resolution is 1.44 km/s. The range of velocities covered by the maps is from -200 to +100 km/s in the local standard of rest. The data are presented in two forms: (1) spectra of brightness temperature as a function of velocity, for fixed positions in right ascension and declination; and (2) maps of the optical depth distribution in the spatial coordinates, for fixed velocity. The deep absorption line at +40 km/s in Sgr A is produced by two separate components. Both components appear to be very massive, dense clouds undergoing rapid rotation about axes perpendicular to the galactic plane. Dissert. Abstr.

N74-31290 Maryland Univ., College Park.
A 26.3 MHz RADIO SOURCE SURVEY WITH AN ABSOLUTE FLUX SCALE Ph.D. Thesis
Melvyn Roger Viner 1973 247 p
Avail: Univ. Microfilms Order No. 74-17066

Absolute flux densities of the radio sources Cyg A, Cas A, Tau A and Vir A have been measured at 26.3 MHz with an accuracy of approximately plus or minus 5 percent with the use of a half-wave dipole over a ground screen and an eight-element grating array. Absolute standards of noise power and attenuation were determined, and the collecting area of the half-wave dipole was calculated via measurements of its radiation resistance. Careful attention was given to details of impedance matching,

variations of attenuation with temperature, ionospheric effects, decorrelation of signals in the receiver bandpasses, effects of receiver time constants, equipment non-linearities, partial resolution of the sources, confusion effects, and possible systematic errors in chart scaling. A summary of accurate relative and absolute measurements on the four sources was compiled, and the spectrum of each source is discussed in detail.
Dissert. Abstr.

N74-31291 Brandeis Univ., Waltham, Mass.
THE COUPLING OF NON-L.T.E. RADIATIVE TRANSFER WITH NON-LINEAR HYDRODYNAMICS: A STUDY IN NON-STEADY STELLAR ATMOSPHERES Ph.D. Thesis
Richard I. Klein 1974 305 p
Avail: Univ. Microfilms Order No. 74-16822

The nonequilibrium processes associated with radiating shock waves in a stellar atmosphere with hydrogen composition were investigated. The fully coupled nonlinear hydrodynamics and the non-L.T.E., non-grey radiative transfer in the Lyman continuum were solved self-consistently. The hydrodynamics was solved using a Lagrangian finite difference scheme with artificial viscosity. The time dependent momentum equation, the fluid displacement, and the specific volume were solved for explicity. Solutions were obtained simultaneously for (1) the non-grey radiative transfer equations, (2) the time dependent rate equation, (3) the time-dependent energy equation, and (4) equations of charge and particle conservation. These coupled equations were solved by a complete linearization schemes. The results of these calculations indicate the development of a shock wave whose features are characterized by a narrow spike in the temperature and whose structure is determined by collisional ionization and radiative recombination processes occurring in the post-shock region. Dissert. Abstr.

N74-31292 California Univ., Santa Barbara.
ON THE ESTABLISHMENT AND EVOLUTION OF ORBIT-ORBIT RESONANCES Ph.D. Thesis
Charles Finney Yoder 1973 314 p
Avail: Univ. Microfilms Order No. 74-14852

In the solar system, there exist several examples of gravitational resonance between two or more satellites or planets in which a special angle variable is observed. It was suggested that, in the case of planetary satellites a tidally induced torque acting on the satellites may have played an essential role in the establishment and subsequent evolution of the observed resonances. This proposal is investigated as it applies to the three resonances among pairs of satellites of Saturn and is shown to be a plausible mechanism for their establishment but is less successful, in the Tital-Hyperion case, in providing a reasonable time scale for the damping of the amplitude of libration. The problem was solved in three stages: (1) a theoretical description of transition is developed, (2) the two body gravitational interaction is expanded and reduced to a one dimensional independent Hamiltonian, and (3) the approach for simple pendulum systems is applied to eccentricity dependent resonances. Dissert. Abstr.

N74-31293 British Library Lending Div., Boston Spa (England).
ATMOSPHERE DISCOVERED ON MERCURY
A. Victorov 8 Feb. 1974 3 p Transl. into English from Izvestia (USSR), 7 Feb. 1974
(BLL-M-23848-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The atmospheric properties of Mercury were studied as Mercury entered the sun's disc. Distinct signs of a glowing halo were found in the violet and ultraviolet regions. The light refraction was two thousand times less than that of the earth. It is concluded that the atmosphere is composed of hydrogen.
F.O.S.

N74-31294 British Library Lending Div., Boston Spa (England).
LUNOKHOD 2: THE PROGRAMME HAS BEEN FULFILLED
A. Vinogradov and S. Sokolov 20 Nov. 1973 10 p Transl. into ENGLISH from Pravda (USSR), 20 Nov. 1973
(BLL-M-23273-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The probing of formations along the lunar surface by the remotely controlled, self-propelled lunar vehicle, Lunokhod 2, is described in general terms. Onboard measuring instruments, cameras, and equipment are reported along with the brief details of experiments performed by the vehicle. Lunar terrain along the route of Lunokhod 2 is also described. Preliminary results of investigations into lunar geologic structure, reflective properties, magnetic fields, and laser rangefinding are also presented.
A.A.D.

N74-31295 British Library Lending Div., Boston Spa (England).
ORION-2: THE FIRST RESULTS
G. Gurzadyan 11 Feb. 1974 4 p Transl. into ENGLISH from Pravda (USSR), 9 Feb. 1974
(BLL-M-23350-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A Soviet news release is presented on the Orion-2 space observatory and its film which was brought back by Soyuz-13 crew. The ultraviolet spectrograms of more than 3000 stars are discussed, along with equipment specifications. J.A.M.

N74-31296 British Library Lending Div., Boston Spa (England).
TOWARDS MYSTERIES OF THE UNIVERSE
R. Sagdeev 1 Feb. 1974 5 p Transl. into ENGLISH from Pravda (USSR), 8 Jan. 1974
(BLL-M-23360-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

An overview of current space research is provided which includes general information on the investigations of near-earth space, the interplanetary medium, solar physics, lunar and planetary geophysics, astrodynamics, and the evolution of the solar system. The use of orbital telescopes and manned space flight in these investigations is briefly discussed, with emphasis on Soviet efforts in both scientific and applied tasks. A.A.D.

N74-31297 British Library Lending Div., Boston Spa (England).
SKYVIEW OF THE EARTH
A. Polzrovsky [1974] 4 p Transl. into ENGLISH from Pravda, 12 Oct. 1973
(BLL-M-23246-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A Soviet news release on the 24th International Astronautical Congress is presented. Highlights of the various papers and films are briefly mentioned. J.A.M.

N74-31298*# Scientific Translation Service, Santa Barbara, Calif.
REFLECTION AND REPROCESSING OF THE RADIATION OF AN X-RAY SOURCE BY THE ATMOSPHERE OF A NORMAL STAR IN A BINARY SYSTEM
M. M. Basko Washington NASA 26 Jul. 1974 42 p refs Transl. into ENGLISH from the Russian Preprint-146
(Contract NASw-2483)
(NASA-TT-F-15769; Preprint-146) Avail: NTIS HC $5.25 CSCL 03B

The transfer of X-ray radiation was numerically investigated in a plane-parallel semi-infinite atmosphere irradiated by an externally incident flux of hard X-ray quanta. Photoabsorption and Comptom scattering processes were taken into account. The values of the albedo and the spectral, polarization, spatial, and temporal characteristics of the reflected signal were found. The results obtained are discussed in connection with the specific systems Her X1 and Cyg X3. The possibility is pointed out of the existence of sources weak in the h upsilon approximate to the 2 to 6 KeV region and bright in the h upsilon approximate to the 15 to 20 KeV region. Results indicate the Her X1 fits this pattern during the 24 days out of 36 days when the pulsar rays are not incident on the earth and it is possible to receive only the radiation reflected by the surface of HZ Her. The nature of the pulsations of the optical radiation of HZ Her is also discussed. Author

N74-31299*# Auburn Univ., Ala. School of Engineering.
MULTIVARIANT FUNCTION MODEL GENERATION Final Report
Jan. 1974 346 p refs
(Grant NGR-01-003-008)
(NASA-CR-139443) Avail: NTIS HC $20.50 CSCL 09B

The development of computer programs applicable to space vehicle guidance was conducted. The subjects discussed are as follows: (1) determination of optimum reentry trajectories, (2)

development of equations for performance of trajectory computation, (3) vehicle control for fuel optimization, (4) development of equations for performance trajectory computations, (5) applications and solution of Hamilton-Jacobi equation, and (6) stresses in dome shaped shells with discontinuities at the apex. For individual titles, see N74-31300 through N74-31306.

N74-31300* Auburn Univ., Ala. Dept. of Mechanical Engineering.
A METHOD FOR DETERMINING OPTIMUM RE-ENTRY TRAJECTORIES
William F. Reiter, Grady R. Harmon, and Joe W. Reece *In its* Multivariant Function Model Generation Jan. 1974 93 p refs (For availability see N74-31299 20-30)
CSCL 22A

The Pontryagin Maximum Principle is used to formulate the problem of finding optimum atmospheric vehicular reentry trajectories. The optimization problem is that of minimizing an integral which is a function of the state and control variables. The vehicle's motion is assumed to be influenced by a gravitational force and an aerodynamic force. The problem is formulated and the necessary equations are developed simultaneously for three sets of Euler angles. Computational procedures are suggested so that numerical trajectories may be generated. Author

N74-31301* Auburn Univ., Ala.
RESEARCH ON DEVELOPMENT OF EQUATIONS FOR PERFORMANCE TRAJECTORY COMPUTATIONS Semiannual Report, 1 Nov. 1967 - 1 May 1968
G. R. Harmon *In its* Multivariant Function Model Generation Jan. 1974 2 p refs (For availability see N74-31299 20-30)
CSCL 12A

The analytical foundation of the Hamilton-Jacobi theory was investigated for application to space flight problems. A specific problem area is defined as follows: (1) to attempt to use the first order perturbation theory, which has been developed for the motion of a uniaxial satellite in a gravitational field in studying the motion of a triaxial satellite in a gravity field; and (2) also to expand theory for the uniaxial case to higher order. Author

N74-31302* Auburn Univ., Ala. Dept. of Mechanical Engineering.
VEHICLE CONTROL FOR FUEL OPTIMIZATION
Klaus D. Dannenberg and Grady R. Harmon *In its* Multivariant Function Model Generation Jan. 1974 18 p refs (For availability see N74-31299 20-30)
CSCL 22A

The problem of predicting the minimum fuel trajectory for a six degree of freedom vehicle which has a motion characterized by the first order differential equations of translational and rotational dynamics is considered. The thrust direction and center of gravity of the vehicle are assumed to be fixed with respect to the vehicle. Thrust magnitude and the control moment are used as control variables and appear linearly in the equation of motion. Pontryagin's Maximum Principle is used to solve the variational problem. With this formulation, the extremal controls are bang-bang with the exception of the singular case. Author

N74-31303* Auburn Univ., Ala.
RESEARCH ON DEVELOPMENT OF EQUATIONS FOR PERFORMANCE TRAJECTORY COMPUTATION Semiannual Report
G. R. Harmon *In its* Multivariant Function Model Generation Jan. 1974 34 p (For availability see N74-31299 20-30)
CSCL 12A

A computer program for computing the performance trajectory of spacecraft was developed. An analytical study of a minimum fuel flight for high speed aircraft was conducted. The computer program to compute a minimum time reentry into the atmosphere for an Apollo-type capsule is presented. A technical summary of the minimum fuel problem is provided. Author

N74-31304* Auburn Univ., Ala. Engineering Experiment Station.
SOME SUGGESTED APPROACHES TO SOLVING THE HAMILTON-JACOBI EQUATION ASSOCIATED WITH CONSTRAINED RIGID BODY MOTION Semiannual Report, 1 May - 1 Nov. 1968
Philip M. Fitzpatrick, Grady R. Harmon, John E. Cochran, and W. A. Shaw *In its* Multivariant Function Model Generation Jan. 1974 49 p refs (For availability see N74-31299 20-30)
CSCL 12A

Some methods of approaching a solution to the Hamilton-Jacobi equation are outlined and examples are given to illustrate particular methods. These methods may be used for cases where the Hamilton-Jacobi equation is not separable and have been particularly useful in solving the rigid body motion of an earth satellite subjected to gravity torques. These general applications may also have usefulness in studying the motion of satellites with aerodynamic torque and in studying space vehicle motion where thrusting is involved. Author

N74-31305* Auburn Univ., Ala. Engineering Experiment Station.
HAMILTON/JACOBI PERTURBATION METHODS APPLIED TO THE ROTATIONAL MOTION OF A RIGID BODY IN A GRAVITATIONAL FIELD Semiannual Report, 1 Nov. 1968 - 1 May 1969
Philip M. Fitzpatrick, Grady R. Harmon, Joseph J. F. Liu, and John E. Cochran *In its* Multivariant Function Model Generation Jan. 1974 29 p refs (For availability see N74-31299 20-30)
CSCL 22A

The formalism for studying perturbations of a triaxial rigid body within the Hamilton-Jacobi framework is developed. The motion of a triaxial artificial earth satellite about its center of mass is studied. Variables are found which permit separation, and the Euler angles and associated conjugate momenta are obtained as functions of canonical constants and time. Author

N74-31306* Auburn Univ., Ala.
STRESSES IN DOME-SHAPED SHELLS OF REVOLUTION WITH DISCONTINUITIES AT THE APEX c32
C. H. Chen, J. C. M. Yu, and W. A. Shaw *In its* Multivariant Function Model Generation Jan. 1974 118 p refs (For availability see N74-31299 20-30)
CSCL 20K

Asymptotic solutions of Novozhilov's equations of shells of revolution are derived for axisymmetric and first harmonic loadings. The solutions obtained are valid throughout the shallow and nonshallow regions. Stresses in dome shaped shells of revolution with a discontinuity in the form of a circular hole, a circular rigid insert, or a nozzle at the apex have been investigated. Numerical results are obtained for spheres, ellipsoids, and paraboloids, containing a discontinuity under a internal pressure and moment. Curves depicting stress distributions are given. The influence of three types of discontinuity on the stresses of the shells is also given. Author

N74-31307*# Dowling Coll., Oakdale, N.Y.
COMETARY INVESTIGATION DURING THE TOTAL SOLAR ECLIPSE OF 7 MARCH 1970 Final Report
Henry C. Courten 30 Nov. 1971 26 p refs
(Grant NGR-33-181-001)
(NASA-CR-139442) Avail: NTIS HC $4.50 CSCL 03B

Photographic observations made during the solar eclipses of 1963, 1966, 1968, and 1970 indicate the presence of previously unidentified celestial objects in the near-angular vicinity of the sun. Observational data and equipment are described. Possible origins of the objects are enumerated, as well as suggested future experiments to confirm the results. Author

N74-31308*# Joint Publications Research Service, Arlington, Va.
THE MOON AS A SPACE SCIENTIFIC STATION
Washington NASA Aug. 1974 38 p Transl. into ENGLISH from the book "Sedmoy Kontinent" Moscow, Mosk. Rabochiy, 1973 p 225-274
(NASA Order W-13183)
(NASA-TT-F-15775) Avail: NTIS HC $5.00 CSCL 22A

Weather forecasting from the moon using satellite monitoring is discussed; this monitoring is used to study air masses in earth's atmosphere, solar activity effects on weather, and climatological observations. Space communications relay station, laboratories, and observatories on the moon are considered. Other planets are also observed from the moon; X ray telescope and radio interferometer data collected on the lunar surface are briefly

reviewed, along with optical equipment and laser bridges.
J.A.M.

N74-31309# Instituto y Observatorio Astronomico de Marina, San Fernando (Spain).
LUNAR OCCULTATION OF THE STARS [OCULTACIONES DE ESTRELLAS POR LA LUNA]
May 1974 42 p In FRENCH; ENGLISH summary
Avail: NTIS HC $5.25

The occultations of stars by the moon during the period 1968-1973 are presented. The times were corrected by equation. Lunar ephemeris j = 2 were used in the reductions. A least square analysis gave the results. Author

N74-31310# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, FLIGHT 1, VISUAL OBSERVATIONS, EQUATORIAL COORDINATES, JULY - OCTOBER 1971
I. I. Katrovskaya, ed. 1973 69 p In RUSSIAN
(Issue-14(154)) Avail: NTIS HC $6.50

The observations of artificial earth satellites which were made by selected ground stations in the U.S.S.R. are reported. The period of the observations is from July through October, 1971. The data elements consist of: (1) the date, (2) the ground station identification, (3) the time interval of the observation, and (4) the number of fixes obtained during the interval of observation. The astronomical coordinates of the satellite are tabulated.
P.N.F.

N74-31311# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, EXPLORER 32, FLIGHT 1, VISUAL OBSERVATIONS, EQUATORIAL COORDINATES, FEBRUARY - NOVEMBER 1972, APRIL - DECEMBER 1972
I. I. Katrovskaya, ed. 1973 70 p In RUSSIAN
(Issue-15(155)) Avail: NTIS HC $6.50

The observations of Explorer 32 satellite which were made by selected ground stations in the U.S.S.R. are reported. The periods of the observations are February to December, 1972. The data elements consist of: (1) the date, (2) the ground station identification, (3) the time interval of the observation, and (4) the number of fixes obtained during the interval of observation. The astronomical coordinates of the satellite are tabulated.
P.N.F.

N74-31312# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, EXPLORER 19, VISUAL OBSERVATIONS, EQUATORIAL COORDINATES, APRIL - DECEMBER 1972
I. I. Katrovskaya, ed. 1973 60 p In RUSSIAN
(Issue-19(159)) Avail: NTIS HC $6.00

The observations of the Explorer 19 satellite which were made from selected ground stations in the U.S.S.R. are reported. The period of time of the observations is from April through December, 1972. The data elements consist of: (1) the date, (2) the ground station identification, (3) the time interval of the observation, and (4) the number of fixes obtained during the interval of observation. The astronomical coordinates are tabulated.
P.N.F.

N74-31313# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, FLIGHT 1, EXPLORER 19, VISUAL OBSERVATIONS, HORIZONTAL COORDINATES, MARCH - NOVEMBER, 1972, MARCH - OCTOBER 1972
I. I. Katrovskaya, ed. 1973 56 p In RUSSIAN
(Issue-16(156)) Avail: NTIS HC $6.00

The observations of Explorer 19 satellite which were made by selected ground stations in the U.S.S.R. are reported. The period of the observations is from March to November, 1972. The data elements consist of: (1) the date, (2) the ground station identification, (3) the time interval of the observation, and (4) the number of fixes obtained during the interval of observation. The astronomical coordinates are tabulated.
P.N.F.

N74-31314# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, EXPLORER 19, EXPLORER 32, AUREOLE, VISUAL OBSERVATIONS, HORIZONATL COORDINATES, MARCH - NOVEMBER 1972
I. I. Katrovskaya, ed. 1973 55 p In RUSSIAN
(Issue-17(157)) Avail: NTIS HC $5.75

The observations of Explorer 19 satellite, Explorer 32 satellite, and the Aureole satellite which were made from selected ground stations in the U.S.S.R. are reported. The period of the observations is from March to November, 1972. The data elements consist of: (1) The date; (2) the ground station identification; (3) the time interval of the observation; and (4) the number of fixes obtained during the interval of observation. The astronomical coordinates of the satellites are tabulated.
P.N.F.

N74-31315# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, EXPLORER 19, EXPLORER 39, AUREOLE, VISUAL OBSERVATIONS, EQUATORIAL COORDINATES, FEBRUARY - MARCH 1972, FEBRUARY - SEPTEMBER 1972, MARCH - DECEMBER 1972
I. I. Katrovskaya, ed. 1973 62 p In RUSSIAN
(Issue-18(158)) Avail: NTIS HC $6.25

The observations of Explorer 19 satellite, Explorer 32 satellite, and the Aureole satellite which were made from selected ground stations in the U.S.S.R. are reported. The period of observation for each satellite is indicated. The data elements consist of: (1) The date; (2) the ground station identification; and (3) the time interval of the observation, and the number of fixes obtained during the interval of observation. The astronomical coordinates of the satellites are tabulated.
P.N.F.

N74-31316# Ryazan State Pedagogical Inst. (USSR).
RESULTS OF ARTIFICIAL EARTH SATELLITE OBSERVATIONS, EXPLORER 19, VISUAL OBSERVATIONS, HORIZONTAL COORDINATES, JANUARY - JUNE 1973
I. I. Katrovskaya, ed. 1973 60 p In RUSSIAN
(Issue-20(160)) Avail: NTIS HC $6.00

The observations of Explorer 19 satellite which were made from selected ground stations in the U.S.S.R. are reported. The period of time of the observations is from January to June, 1973. The data elements consist of: (1) the date; (2) the ground station identification; (3) the time interval of the observation; and (4) the number of fixes obtained during the interval of observation. The astronomical coordinates are tabulated.
P.N.F.

N74-31317*# Maryland Univ., College Park. Space Physics Group.
POST-SHOCK SPIKES: A NEW FEATURE OF PROTON AND ALPHA ENHANCEMENTS ASSOCIATED WITH AN INTERPLANETARY SHOCK WAVE
G. Gloeckler, F. M. Ipavich, C. Y. Fan (Arizona Univ., Tucson), and D. Hovestadt (Max Planck Inst., Garching, Germany) Jun. 1974 17 p refs Submitted for publication
(Contract NAS5-11063; Grant NGR-21-002-224)
(NASA-CR-139388; TR-74-115) Avail: NTIS HC $4.00 CSCL 03B

Abrupt and prolonged enhancements in the intensities of 100 to approximately 2000 keV nucleon protons and alpha particles observed in interplanetary space are interpreted as particle populations confined between an interplanetary shock front and a magnetic field discontinuity. Prominent intensity spikes observed only below approximately 400 keV per charge for both protons and alpha particles several hours behind the shock front suggest that some fraction of the confined particles is accelerated by an energy per charge dependent process. Author

N74-31318*# Maryland Univ., College Park. Space Physics Group.
POSSIBLE ACCELERATION OF CHARGED PARTICLES THROUGH THE RECONNECTION OF MAGNETIC FIELD LINES IN INTERPLANETARY SPACE
E. H. Levy (Franklin Inst., Swarthmore, Pa.), F. M. Ipavich, and G. Gloeckler Jun. 1974 18 p refs Submitted for publication; Sponsored in part by NSF
(Contract NAS5-11063; Grant NGR-21-002-224)
(NASA-CR-139387; TR-74-116) Avail: NTIS HC $4.00 CSCL 03B

Prominent intensity spikes in the flux of protons and alphas with less than 0.5 MeV per charge were observed in the region

several hours behind an interplanetary shock front. The small spatial scale of these events and the high anisotropy of the particle flux suggest local acceleration. The spectra of the particles, which are cut off at equal energy per charge, suggest acceleration through an electric field. The possibility is examined that these events have their origin in active magnetic neutral sheets in the shocked solar wind. Author

N74-31319*# Texas A&M Univ., College Station. Dept. of Physics.
IS THE FOUR-DAY ROTATION OF VENUS ILLUSORY?
Andrew T. Young [1974] 30 p refs Submitted for publication
(Grant NGR-44-001-117)
(NASA-CR-139559; Rept-11) Avail: NTIS HC $4.50 CSCL 03B

An overlooked systematic error exists in the apparent radial velocities of solar lines reflected from regions of Venus near the terminator, owing to a combination of the finite angular size of the Sun and its large (2 km/sec) equatorial velocity of rotation. This error produces an apparent, but fictitious, retrograde component of planetary rotation, typically on the order of 40 meters/sec. Spectroscopic, photometric, and radiometric evidence against a 4-day atmospheric rotation is also reviewed. The bulk of the somewhat contradictory evidence seems to favor slow motions, on the order of 5 m/sec, in the atmosphere of Venus; the 4-day rotation may be due to a traveling wave-like disturbance, not bulk motions, driven by the UV albedo differences. Author

N74-31320*# International Business Machines Corp., Gaithersburg, Md.
TARGETTING AND GUIDANCE PROGRAM DOCUMENTATION Final Report
E. F. Harrold and J. F. Neyhard 15 Jul. 1974 61 p Prepared in cooperation with IBM, Burlington, Mass.
(Contract NAS8-28425)
(NASA-CR-120393) Avail: NTIS HC $6.25 CSCL 22A

A FORTRAN computer program was developed which automatically targets two and three burn rendezvous missions and performs feedback guidance using the GUIDE algorithm. The program was designed to accept a large class of orbit specifications and to automatically choose a two or three burn mission depending upon the time alignment of the vehicle and target. The orbits may be specified as any combination of circular and elliptical orbits and may be coplanar or inclined, but must be aligned coaxially with their perigees in the same direction. The program accomplishes the required targeting by repeatedly converging successively more complex missions. It solves the coplanar impulsive version of the mission, then the finite burn coplanar mission, and finally, the full plane change mission. The GUIDE algorithm is exercised in a feedback guidance mode by taking the targeted solution and moving the vehicle state step by step ahead in time, adding acceleration and navigational errors, and reconverging from the perturbed states at fixed guidance update intervals. A program overview is presented, along with a user's guide which details input, output, and the various subroutines. Author

N74-31321*# Dartmouth Coll., Hanover, N.H.
RESULTS OF X-RAY AND OPTICAL MONITORING OF SCO X-1
D. E. Mook, R. J. Messina, W. A. Hiltner (Mich. Univ.), R. Belian (LASL), J. Conner (LASL), W. D. Evans (LASL), I. Strong (LASL), V. Blanco (Cerro Tololo Inter-Am. Obs.), J. Hesser (Cerro Tololo Inter-Am. Obs.), and W. Kunkel (Cerro Tololo Inter-Am. Obs.) [1974] 41 p refs
(Grant NGR-23-005-464)
(NASA-CR-139568) Avail: NTIS HC $5.00 CSCL 03A

Sco X-1 was monitored at optical and X-ray wavelengths from 1970 April 26 to 1970 May 21. The optical observations were made at six observatories around the world and the X-ray observations were made by the Vela satellites. There was a tendency for the object to show greater variability in X-ray when the object is optically bright. A discussion of the intensity histograms is presented for both the optical and X-ray observations. No evidence for optical or X-ray periodicity was detected. Author

N74-31322*# Cerro Tololo Inter-American Observatory, La Serena (Chile).
PHYSICAL PARAMETERS OF THE CEN X-3 SYSTEM
Patrick S. Osmer, W. A. Hiltner (Mich. Univ.), and J. A. J. Whelan (Inst. of Astronomy) [1974] 10 p refs
(Grant NGR-23-005-464)
(NASA-CR-139569) Avail: NTIS HC $4.00 CSCL 03A

Photographic spectra of Cen X-3 show that the primary star has a spectral type near O6.5 with weak, variable emission at wavelength 4640 and 4686. No orbital motion of the emission or absorption lines is detected; for the latter the upper limit is approximately + or - 50 km/s. Analysis of the available data indicates that the primary is a factor of 2-3 less massive than expected from normal evolutionary models while the X-ray source has a solar mass near 1.5. Author

N74-31323*# Michigan Univ., Ann Arbor.
PHOTOELECTRIC OBSERVATIONS OF KRZEMINSKI'S STAR, THE COMPANION OF CEN X-3
Larry D. Petro [1974] 15 p refs
(Grant NGR-23-005-464)
(NASA-CR-139570) Avail: NTIS HC $4.00 CSCL 03A

Centaurus X-3 was the first discovered X-ray source whose intensity is pulsed and eclipsed. Though the X-ray properties of the Cen X-3 system have been intensively studied, the optical properties remained unstudied until Krzeminski's identification of the optical counterpart of Cen X-3. Observations of the X-ray eclipse duration, pulsation frequency variation, and pulse arrival time variation have been used to place limits on the nature of the system and to predict the nature of the optical companion and X-ray sources. An observational determination is presented of the several system parameters based on a preliminary interpretation of the light curve of Krzeminski's star. Author

N74-31324# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
SURVEY OF METEORITE RESEARCH AS OF 1973
D. Fink 1973 129 p refs In GERMAN
(HMI-B-138) Avail: AEC Depository Libraries HC $8.50

A survey is given of the results in meteorite research of the last few years. Particular emphasis is placed on theories on the origin of meteorites and on the time dependence of meteorite flux rates. Furthermore, problems of the formation of craters are reported. Recent results of Moon and Mars research are included and mineralogic and chemical aspects are briefly touched upon. Chrondrules which are enriched with solar wind are treated in great detail. Author (NSA)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N74-31325 Cornell Univ., Ithaca, N.Y.
THE MECHANICAL ANALYSIS AND DESIGN OF A JUPITER ORBITING SPACECRAFT FOR ENVIRONMENTAL STUDIES Ph.D. Thesis
Michael Hall Redlin 1974 185 p
Avail: Univ. Microfilms Order No. 74-17678

A feasibility study and preliminary mechanical analysis of a Jupiter orbiting spacecraft for environmental studies includes attention to the following: (1) initial sizing of the spacecraft within the constraints of the mission profile; (2) designing a spacecraft configuration compatible with the mission objectives; and (3) providing the spacecraft with sufficient protection to withstand the environment of space, specifically, solar radiation and meteoroids. The design shows specifications for instrumentation which will be capable of measuring parameters important to several areas of scientific investigation including magnetic fields, basic atmospheric and surface conditions, radiation belts, solar inputs, basic topography and composition, and the biological makeup of Jupiter. Dissert. Abstr.

N74-31326 British Library Lending Div., Boston Spa (England).
A ROAD TO SPACE
16 Nov. 1973 3 p Transl. into ENGLISH from Pravda (USSR), 16 Nov. 1973
(BLL-M-23271-(5828.4F)) Avail: British Library Lending Div., Boston Spa., Engl.: 1 BLL photocopy coupon

The agreement between the U.S.S.R. Academy of Sciences and the Indian Space Research Organization is discussed. The transaction concerns the launching of the first Indian research satellite, which is to be put in orbit by a Soviet carrier rocket launched from Soviet territory. The expected accomplishments of the Indian satellite are examined. Author

N74-31327 British Library Lending Div., Boston Spa (England).
SPACE ENVOYS OF SOCIALIST COMMUNITY
Y. Chugunov 21 Nov. 1973 4 p Transl. into ENGLISH from Gudok (USSR), 21 Nov. 1973
(BLL-M-23274-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The earth satellite Intercosmos 10 was launched in the Soviet Union on 31 October, 1973, in conformity with the program of the socialist countries' cooperation in the field of research and the use of space. The aim of the launching is the implementation of the program of geophysical surveys in high latitudes. The primary purpose of the mission is to study the interaction of electric and magnetic fields in the atmosphere and to determine their characteristics. Author

N74-31328*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
REUSABLE AGENA STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report, Jun. 1973 - Jan. 1974
15 Mar. 1974 38 p ref 2 Vol.
(Contract NAS8-29952)
(NASA-CR-120361; LMSC-D383059-Vol-1) Avail: NTIS HC $5.00 CSCL 22B

The shuttle Agena upper stage interim tug concept is based on a building block approach. These building block concepts are extensions of existing ascent Agena configurations. Several current improvements, have been used in developing the shuttle/Agena upper stage concepts. High-density acid is used as the Agena upper stage oxidizer. The baffled injector is used in the main engine. The DF-224 is a fourth generation computer currently in development and will be flight proven in the near future. The Agena upper stage building block concept uses the current Agena as a baseline, adds an 8.5-inch (21.6 cm) extension to the fuel tank for optimum mixture ratio, uses monomethyl hydrazine as fuel, exchanges a 150:1 nozzle extension for the existing 45:1, exchanges an Autonetics DF-224 for the existing Honeywell computer, and adds a star sensor for guidance update. These modifications to the current Agena provide a 5-foot (1.52m) diameter shuttle/Agena upper stage that will fly all Vandenberg Air Force Base missions in the reusable mode without resorting to a kick motor. The delta V velocity of the Agena is increased by use of a strap-on propellant tank option. This option provides a shuttle/Agena upper stage with the capability to place almost 3900 pounds (1769 kg) into geosynchronous orbit (24 hour period) without the aid of kick motors. Author

N74-31329*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO 15 MISSION REPORT. SUPPLEMENT 2: SERVICE PROPULSION SYSTEM FINAL FLIGHT EVALUATION
R. J. Smith and S. C. Wood Nov. 1972 81 p refs Prepared by TRW Systems
(Contract NAS9-12330)
(NASA-TM-X-70291; TRW-20029-H102-RO-00-Suppl-2; MSC-06151-Suppl-2) Avail: NTIS HC $7.25 CSCL 22C

The command and service module 112 service propulsion system performance for the Apollo 15 mission was evaluated and found to be satisfactory. The following items were considered: (1) the steady-state performance as determined from analysis of the third and eight burns; (2) techniques, problems, and assumptions; (3) flight analysis results as compared to the preflight predicted performance; (4) the propellant utilization and gaging system operation; (5) the pressurization system performance; (6) transient data; and (7) revision of estimated propellant consumption. Author

N74-31330*# North American Rockwell Corp., Downey, Calif. Space Div.
SPACE SHUTTLE PHASE B. VOLUME 1: EXECUTIVE SUMMARY Final Report
15 Mar. 1972 32 p
(Contract NAS9-10960)
(NASA-CR-134352; SD-72-SH-0012-1-Vol-1; MSC-03332-Vol-1) Avail: NTIS HC $4.75 CSCL 22B

A study was conducted to identify the differences among total system concepts of space shuttle configurations. Emphasis was placed on concepts that lead to selection of a system that performs the missions within budget and schedule constraints. The spectrum of launch vehicle configurations is illustrated. An inboard profile of the spacecraft is presented to show the interior arrangement of the major subsystems. The performance prediction of the spacecraft during specified portions of the mission is analyzed. A cost comparison of the various concepts is included. Author

N74-31331*# North American Rockwell Corp., Downey, Calif. Space Div.
SPACE SHUTTLE PHASE B. VOLUME 2: TECHNICAL SUMMARY, ADDENDUM A Final Report
15 Mar. 1971 95 p
(Contract NAS9-10960)
(NASA-CR-134354; SD-72-SH-0012-2-Vol-2-Add-A; MSC-03332-Vol-2-Add-A) Avail: NTIS HC $7.75 CSCL 22B

A study was conducted to analyze the characteristics and performance data for the booster vehicles to be used with the space shuttle operations. It was determined that the single pressure-fed booster offered the lowest program cost per flight of the pressure-fed booster arrangements studied. The fly back booster required the highest peak annual funding and highest program cost. It was recommended that the pressure-fed booster, series burn with liquid oxygen phase, be continued for further study. The flyback booster study was discontinued. Both solid and liquid propelled booster vehicles with 14 by 45 foot and 15 by 60 foot payload orbiters were considered. Author

N74-31332*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE CAPABILITY OF LASER-POWERED LAUNCH VEHICLES USING VERTICAL ASCENT TRAJECTORIES
Omer F. Spurlock Washington Aug. 1974 19 p refs
(NASA-TM-X-3085; E-7929) Avail: NTIS HC $3.00 CSCL 20E

The use of a ground-based high-power laser source to power a vertically launched rocket vehicle is investigated. By using a vertical ascent trajectory, only a single laser source is required. The vertical ascent mode is not applicable to earth orbit destinations but is applicable to missions beyond earth escape. Performance and trajectory characteristics are examined for vertical trajectories to earth escape and solar escape (which may be of interest in the future for radioactive waste disposal). Specific impulse values from 2000 to 5000 seconds are considered. With these values, a single-stage vehicle can deliver payloads to earth escape and beyond, but extremely high power sources (gigawatts) are required. Author

N74-31333*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANALYTICAL DYNAMICS AND NONRIGID SPACECRAFT SIMULATION
P. W. Likins 15 Jul. 1974 147 p refs
(Contract NAS7-100)
(NASA-CR-139502; JPL-TR-32-1593) Avail: NTIS HC $10.50 CSCL 22B

Application to the simulation of idealized spacecraft are considered both for multiple-rigid-body models and for models consisting of combination of rigid bodies and elastic bodies, with the elastic bodies being defined either as continua, as finite-element systems, or as a collection of given modal data. Several specific examples are developed in detail by alternative methods of analytical mechanics, and results are compared to a Newton-Euler formulation. The following methods are developed from d'Alembert's principle in vector form: (1) Lagrange's form of d'Alembert's principle for independent generalized coordinates; (2) Lagrange's form of d'Alembert's principle for simply constrained

systems; (3) Kane's quasi-coordinate formulation of D'Alembert's principle; (4) Lagrange's equations for independent generalized coordinates; (5) Lagrange's equations for simply constrained systems; (6) Lagrangian quasi-coordinate equations (or the Boltzmann-Hamel equations); (7) Hamilton's equations for simply constrained systems; and (8) Hamilton's equations for independent generalized coordinates. Author

N74-31334*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB APOLLO TELESCOPE MOUNT
A. R. Morse 28 Jun. 1974 429 p
(NASA-TM-X-64811) Avail: NTIS HC $9.00 CSCL 22B

A technical history and management critique of the Skylab Apollo Telescope Mount (ATM) from initial conception through the design, manufacturing, testing and prelaunch phases is presented. A mission performance summary provides a general overview of the ATM's achievements in relationship to its design goals. Recommendations and conclusions applicable to hardware design, test program philosophy and performance, and program management techniques for the ATM with potential application to future programs are also discussed. Author

N74-31335*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB THERMAL AND ENVIRONMENTAL CONTROL SYSTEM MISSION EVALUATION
G. D. Hopson, J. W. Littles, and W. C. Patterson Jun. 1974 488 p refs
(NASA-TM-X-64822) Avail: NTIS HC $9.75 CSCL 22B

An evaluation of the performance of the Skylab thermal and environmental control system is presented. Actual performance is compared to design and functional requirements and anomalies and discrepancies and their resolution are discussed. The thermal and environmental control systems performed their intended role. Based on the experience gained in design, development and flight, recommendations are provided which may be beneficial to future system designs. Author

N74-31336# Fairchild Space and Electronics Co., Germantown, Md.
SPACECRAFT STANDARDIZATION THROUGH NUCLEAR POWER
Elmer J. Frey, Bernard Raab, Alfred Schock, and Robert T. Carpenter (AEC, Germantown, Md.) 9 Nov. 1973 25 p refs Backup document for AIAA Synoptic scheduled for publication in the Journal of Spacecraft and Rockets, November 1974
Avail: NTIS HC $4.25

A conceptual design study showed that standardized, shuttle-launched spacecraft serving many space missions and a wide variety of orbital conditions could be designed around the use of nuclear electric power systems. One spacecraft design was based on the use of from one to three Radioisotope Thermoelectric Generators (RTG) to provide up to 450 watts of electrical power. A second design based on a Brayton cycle alternator fueled by up to three of the same RTG heat sources meets power requirements from 5000 to 2000 watts. Both spacecraft provide adequate weight, volume, and mounting surfaces for most of the payloads anticipated in the 1980 decade. A key to the broad applicability of the designs is the use of waste heat from the radioisotope heat sources to provide a benign environment for all internal equipment in all orbits with minimal spacecraft changes. Economic analysis indicated that the development cost of such spacecraft would be amortized over very few missions, with significant savings thereafter.
Author

N74-31337*# Kanner (Leo) Associates, Redwood City, Calif.
THE GEODESIC SATELLITE STARLETTE
Washington NASA Jul. 1974 24 p Transl. into ENGLISH from the French report
(Contract NASw-2481)
(NASA-TT-F-15848) Avail: NTIS HC $4.25 CSCL 22B

The Starlette satellite is a passive device with no transmitting parts, designed to furnish geodesic information through laser firing from the ground. The design of the satellite and its flight specifications are described. Its mission will include study of geopotential, earth tides, oceanic tides, and polar movement, plus fine determination of the positions of the stations on the ground. Author

N74-31338# Rockwell International Corp., Canoga Park, Calif.
SPACE SHUTTLE: AN OPPORTUNITY FOR UNIVERSITY RESEARCH
[1974] 8 p
Avail: NTiS HC $4.00

The advantages of using the space shuttle as a carrier of university experiments are discussed in terms of cost benefits, length and frequency of flights, multiplicity of payload capabilities, and direct onboard experimental control. A typical university research experiment is described as an example of the uses versus the alternatives of space shuttle flight, and typical problem areas are identified which would lend themselves successfully to shuttle operations. The direct implications of cooperation for both the university and for the space shuttle program are defined. A.A.D.

N74-31339# Rockwell International Corp., Canoga Park, Calif.
SPACE SHUTTLE: THE TIMING IS RIGHT
[1971] 16 p
Avail: NTIS HC $4.00

The capabilities provided by the space shuttle program are interpreted within the larger realms of societal needs and technological evolution. The missions most applicable to this interpretation are identified and include the following: (1) information transmission via shuttle-delivered and maintained satellite networks; (2) earth resources surveillance; (3) launch support for an earth services satellite network; and (4) the shuttle-compatible power relay satellite system for efficient global power transmission and distribution. Certain direct contributions of space shuttle operations to the economic posture of the U.S. in world trade are also discussed. Space shuttle capabilities are seen as instrumental to national growth and problem solving for the next two decades. A.A.D.

N74-31340*# Research Triangle Inst., Research Triangle Park, N.C.
ENGINEERING STUDIES RELATED TO SKYLAB PROGRAM
George S. Hayne Jul. 1973 37 p
(Contract NAS6-2307)
(NASA-CR-137463) Avail: NTIS HC $5.00 CSCL 22B

The relationship between the S-193 Automatic Gain Control data and the magnitude of received signal power was studied in order to characterize performance parameters for Skylab equipment. The r-factor was used for the assessment and is defined to be less than unity, and a function of off-nadir angle, ocean surface roughness, and receiver signal to noise ratio. A digital computer simulation was also used to assess to additive receiver, or white noise. The system model for the digital simulation is described, along with intermediate frequency and video impulse response functions used, details of the input waveforms, and results to date. Specific discussion of the digital computer programs used is also provided. Author

N74-31341*# TRW Systems Group, Redondo Beach, Calif.
COMPATIBILITY TESTING OF SPACECRAFT MATERIALS AND SPACESTORABLE LIQUID PROPELLANTS Final Report
J. R. Denson and A. Toy Feb. 1974 90 p Prepared for JPL
(Contract NAS7-100)
(NASA-CR-139391; TRW-23162-6020-RU-00) Avail: NTIS HC $7.50 CSCL 22B

Compatibility data for aluminum alloy 2219-T87 and titanium alloy Ti-6Al-4V were obtained while these alloys were exposed to both liquid and vapor fluorine and FLOX at -320 F + or - 10 F. These data were obtained using a new low cost compatibility method which incorporates totally sealed containers and double dogbone test specimens and propellants in the simultaneous exposure to vapor and liquid phases. The compatibility investigation covered a storage period in excess of one year. Pitting was more severe in the 2219-T87 aluminum alloy than in the Ti-6Al-4V titanium alloy for both fluorine and FLOX exposure. The degree of chemical attack is more severe in the presence of FLOX than in fluorine and phase. The mechanical

properties of the two alloys were not affected by storage in either of the two propellants. Author

N74-31342*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NATURAL ENVIRONMENT SUPPORT GUIDELINES FOR SPACE SHUTTLE TESTS AND OPERATIONS
E. A. Carter and S. C. Brown Jul. 1974 108 p refs
(NASA-TM-X-64864) Avail: NTIS HC $4.50 CSCL 22B

All space shuttle events from launch through solid rocket booster recovery and orbiter landing are considered in terms of constraints placed on those operations by the natural environment. Thunderstorm activity is discussed as an example of a possible hazard. The activities most likely to require advanced detection and monitoring techniques are identified as those from deorbit decision to Orbiter landing. The inflexible flight plan will require the transmission of real time wind profile information below 24 km and warnings of thunderstorms or turbulence in the Orbiter flight path. Extensive aerial reconnaissance and communication facilities and procedures to permit immediate transmission of aircraft reports to the mission control authority and to the Orbiter will also be required. Author

N74-31343*# General Dynamics/Convair, San Diego, Calif.
ROOM TEMPERATURE STRETCH FORMING OF SCALE SPACE SHUTTLE EXTERNAL TANK DOME GORES. VOLUME 1: TECHNICAL Final Report
R. D. Blunck and D. E. Krantz Jun. 1974 47 p ref 2 Vol.
(Contract NAS8-30665)
(NASA-CR-120365; CASD-NAS-74-029-Vol-1) Avail: NTIS HC $5.50 CSCL 22B

An account of activities and data gathered in the Room Temperature Stretch Forming of One-third Scale External Tank Bulkhead Gores for space shuttle study, and a tooling design and production cost study are reported. The following study phases are described: (1) the stretch forming of three approximately one-third scale external tank dome gores from single sheets of 2219-T37 aluminum alloy; (2) the designing of a full scale production die, including a determination of tooling requirements; and (3) the determination of cost per gore at the required production rates, including manufacturing, packaging, and shipping. Author

N74-31344*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PARACHUTE-DEPLOYMENT-PARAMETER N BASED ON AN ANALYTICAL SIMULATION OF VIKING BLDT AV-4
Theodore A. Talay Washington Aug. 1974 49 p refs
(NASA-TN-D-7678) Avail: NTIS HC $3.25 CSCL 22B

A six-degree-of-freedom analytical simulation of parachute deployment dynamics developed at the Langley Research Center is presented. A comparison study was made using flight results from the Viking Balloon Launched Decelerator Test (BLDT) AV-4. Since there are significant voids in the knowledge of vehicle and decelerator aerodynamics and suspension system physical properties, a set of deployment-parameter input has been defined which may be used as a basis for future studies of parachute deployment dynamics. The study indicates the analytical model is sufficiently sophisticated to investigate parachute deployment dynamics with reasonable accuracy. Author

N74-31345*# Martin Marietta Aerospace, Denver, Colo.
PAYLOAD/ORBITER CONTAMINATION CONTROL REQUIREMENT STUDY Final Report
L. E. Bareiss, R. O. Rantanen, and E. B. Ress 24 May 1974 154 p refs
(Contract NAS8-30452)
(NASA-CR-120379; MCR-74-93) Avail: NTIS HC $10.75 CSCL 06M

A study was conducted to determine and quantify the expected particulate and molecular on-orbit contaminant environment for selected space shuttle payloads as a result of major shuttle orbiter contamination sources. Individual payload susceptibilities to contamination are reviewed. The risk of payload degradation is identified and preliminary recommendations are provided concerning the limiting factors which may depend on operational activities associated with the payload/orbiter interface or upon independent payload functional activities. A basic computer model of the space shuttle orbiter which includes a representative payload configuration is developed. The major orbiter contamination sources, locations, and flux characteristics based upon available data have been defined and modeled. Author

N74-31346*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
REUSABLE CENTAUR STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report, Jun. - Dec. 1973
D. A. Heald et al 15 Mar. 1974 38 p ref 2 Vol.
(Contract NAS8-30290)
(NASA-CR-120372; CASD-NAS-73-032-Vol-1) Avail: NTIS HC $5.00 CSCL 22B

A study of the Reusable Centaur for use as an initial upper stage with the space shuttle was conducted. The currently operative Centaur stage, with modifications for space shuttle orbiter compatibility and for improved performance, represents a cost effective development solution. The performance needs and available development funds are discussed. The main features of three Reusable Centaur configurations with increasing capability at increasing development costs are summarized. Author

N74-31347*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
REUSABLE CENTAUR STUDY. VOLUME 2: FINAL REPORT Report for Jun. - Dec. 1973
D. A. Heald 15 Mar. 1974 317 p refs 2 Vol.
(Contract NAS8-30290)
(NASA-CR-120373; CASD-NAS-73-032-Vol-2) Avail: NTIS HC $19.00 CSCL 22B

For abstract, see N74-31346.

N74-31348*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HYPERSONIC STABILITY AND CONTROL CHARACTERISTICS OF THE ROCKWELL INTERNATIONAL 139-B SPACE SHUTTLE ORBITER
David R. Stone and Robert Mulfinger Jul. 1974 147 p refs
(NASA-TM-X-71968) Avail: NTIS HC $4.75 CSCL 22B

The purpose of this study was to determine the hypersonic aerodynamic performance, longitudinal trim, static stability, and the extent of the center-of-gravity boundaries within the design control limits as well as to examine the effect of Reynolds number on the longitudinal stability of the 139-B space shuttle orbiter. A 0.004 scale model (34-0)was tested in helium over an angle of attack range of 18 deg to 54 deg at 0 deg and -minus 5 deg sideslip angles. The total pressure was varied for selected configurations to obtain a Reynolds number range, based on model length, from 0.51 million to 3.6 million at Mach numbers between 17.6 and 21.6 Surface oil-flow studies and electron-beam illuminated-flow studies were also conducted at angles-of-attack of 30 deg, 40 deg, and 50 deg for selected Reynolds numbers. Author

N74-31349# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 6
K. S. Russell 6 Apr. 1974 30 p ref
(ROE-STS-174-Pt-6) Avail: NTIS HC $4.50

Timed observations, made in azimuth and elevation with a kinetheodolite are listed in satellite launch and time order for each satellite: fully reduced observations of 25 transits of satellites 1962 beta-kappa 1, 1962 beta-mu 2, 1962 beta-tau 2 and 1962 beta-chi 1. Author (ESRO)

N74-31350# Little (Arthur D.), Inc., Cambridge, Mass.
INCORPORATION OF AN INTERNAL DATA VALIDATION PROCESS AND AN INTERVAL ESTIMATION CAPABILITY WITHIN THE AFCRL ROCKET TRAJECTORY SYSTEM Final Report
William R. Schonbein Nov. 1973 53 p refs
(Contract F19628-73-C-0026)
(AD-780525; ADL-C-75276; AFCRL-TR-74-0186) Avail: NTIS CSCL 19/4

The report describes the mathematical methods required to incorporate within the AFCRL Rocket Trajectory System both

an internal data validation process and, as an option, an interval estimation capability. The introduction of equations, of powered flight and card input data accuracy requirements are also discussed. Author (GRA)

N74-30937* Martin Marietta Corp., Orlando, Fla.
ADHESIVES AND THE ATS SATELLITE
Frank E. Hancock *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 8 p (For availability see N74-30922 20-15)
CSCL 22B

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-31351 Vanderbilt Univ., Nashville, Tenn.
CHARACTERIZATION OF MATERIAL PARAMETERS AND THE MEASUREMENT OF RESIDUAL STRESSES IN METALS USING ULTRASONIC TECHNIQUES Ph.D. Thesis
Pascal Joseph Noronha 1973 133 p
Avail: Univ. Microfilms Order No. 74-16163

Attempts were made to devise a technique, using ultrasonic radiation, to measure stress in metals. The technique used proved successful in measuring simulated residual stress in A36 steel I-Beams. The velocity of ultrasonic shear waves increases linearly with the application of stress to a metal. The linear increase allows the definition of three constants for every metal--the total, the longitudinal or parallel, and the transverse or perpendicular stress acoustic constants. The metals studied were pure Al, 6061 Al, and steel. Some incidental results obtained during the study are also reported. These include the study of the acoustoelastic effect in commercial materials and a perfectly isotropic material; and a method whereby ultrasonic velocity measurements may be used to characterize the state of heat treatment of 6061 Al. Dissert. Abstr.

N74-31352 University of Southern Calif., Los Angeles.
ON THE STRESSES IN A CIRCULAR CYLINDRICAL SHELL CONTAINING TWO CIRCULAR HOLES Ph.D. Thesis
Abdel Saleh Hafiz 1974 88 p
Avail: Univ. Microfilms Order No. 74-17347

The stress distribution of an infinitely long circular cylindrical shell with two equal circular holes located along a generator in its surface is obtained. The cylinder is loaded by longitudinal tension. The governing differential equation is solved by a Fourier series which involves Hankel and Bessel functions of complex arguments. The method of analysis yields an infinite set of linear algebraic equations. A uniqueness condition is also discussed and is found to yield an independent condition which is satisfied. The method has the advantage that it is valid for all curvature parameters, although convergence problems are found for large curvature. The stress distribution is obtained along the boundaries of the holes and the interior of the shell. It is found that the stress concentration factor is reduced by the presence of another hole. A computer program was developed to implement the analysis and several example problems are presented. Dissert. Abstr.

N74-31353 British Library Lending Div., Boston Spa (England).
THERMOELASTIC STRESSES DURING THE HEATING OF A HOLLOW CYLINDER OF UNLIMITED LENGTH IN AN ENVIRONMENT WITH A HEAT FLOW VARYING LINEARLY WITH TIME
A. G. Sabelnikov and N. Yu. Taits [1974] 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 8, 1973 p 145-147
(BLL-M-21832-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Solutions are obtained for calculating the temperature fields and thermoelastic stresses, generated when heating a hollow cylinder of unlimited length in an environment with linear variation of the heat flow with time. Under the conditions of the problem it is assumed that the flow of heat to the external and internal surfaces is different: the solutions are also presented in the dimensionless form. Author

N74-31354 British Library Lending Div., Boston Spa (England).
THE SUPPORTING EFFECT OF BENDING SPECIMENS UNDER STATIC LOAD IN THE RANGE BETWEEN 400 AND 500 C
K. Wellinger et al 27 Feb. 1974 13 p refs Transl. into ENGLISH from Materialprufung (West Ger.), v. 15, Jun. 1973 p 209-213
(BLL-CE-Trans-6347-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

In creep tests on plain bending and tensile specimens with continuous strain measurement, support factors were determined as a function of strain, time and temperature for H 2 steel at 400, 450 and 500 C and on 13 CrMo44 steel at 500 C, over periods of up to 10,000 hours. A qualitative discussion of the trends observed in the values obtained for the support factors as a function of the temperature of application and the shape of the creep curves is presented. The influence of restrictions on transverse strain is shown. Author

N74-31355# Technische Hochschule, Darmstadt (West Germany).
A CONTRIBUTION FOR CALCULATING PLATES BY A POTENTIAL THEORETICAL ANALOG PROCEDURE Ph.D. Thesis [EIN BEITRAG ZUR BERECHNUNG VON PLATTEN MIT HILFE EINES POTENTIALTHEORETISCHEN ANALOGIEVERFAHRENS]
Peter Schwarz 1973 106 p refs In GERMAN
Avail: NTIS HC $8.50

The modified electric potential formula is used to generate an analog elasticity model for calculating loads on polygonal limited plates that have free-, turnable-, or fastened-edges. The numerical solution provides a simple infinite series whose coefficients are contained in the solution for a linear equation system. A computerized example calculation for plates having Navier edges under evenly distributed surface loads is included. Transl. by G.G.

N74-31356# Technische Universitaet, Munich (West Germany).
SERVICE LIFE PREDICTION FOR OSCILLATING LOADED SHARPLY NOTCHED CONSTRUCTION MEMBERS USING FRACTURE MECHANICS Ph.D. Thesis [LEBENSDAUERVORHERSAGE SCHWINGEND BEANSPRUCHTER SCHARF GEKERBTER BAUTEILE AUF DER GRUNDLAGE DER BRUCHMECHANIK]
Reinhard Wagner 30 Jul. 1973 119 p refs In GERMAN
Avail: NTIS HC $9.00

Elastic linear fracture mechanics are used to present the maximal strain at the base of a notched structural part under permanent oscillating load solely as a function of notch radius. The effect of the notch radius on crack propagation and fracture load cycle criterion is analyzed and a procedure is presented that uses only the Woehler lines on a notched rod to calculate a cyclic stress-strain line on an unnotched example rod. Transl. by G.G.

N74-31357*# Kanner (Leo) Associates, Redwood City, Calif.
PHASE AND STRUCTURAL VARIATIONS IN TITANIUM UNDER TRANSIENT LOADS
P. O. Pashkov, B. Ye. Gokhshteyn, and I. I. Polyakova Washington NASA Jul. 1974 7 p refs Transl. into ENGLISH from the book "Fazovyye i Strukturnyye Izmeneniya v Titane pri Impulsivnykh Nagruzkakh" Moscow, Nauka Press, 1972 p 70-73 (Contract NASw-2481)
(NASA-TT-F-15469) Avail: NTIS HC $4.00 CSCL 20K

Research into phase and structural variations in titanium under transient loads showed that there was a phase transition under pressure, similar to that of the alpha-omega phase transition during static loading. A method was developed to fix the high temperature phase in pure titanium by freezing in liquid nitrogen and applying dynamic pressure. This can also be used for studying high temperature phases of other pure metals. Author

N74-31358# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
MINIMUM WEIGHT SANDWICH BEAM DESIGN
S. N. Huang and D. W. Alspaugh Mar. 1974 36 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Dec. 1974
Avail: NTIS HC $5.00

The minimum weight design of sandwich beams was formulated using optimal control theory. The analysis was carried out in terms of the partial deflections of w sub b and w sub s. The thicknesses of the faces and core were used as control variables. Inequality constraints on deflection, stress, and thicknesses are considered. The resulting two point boundary value problem was solved using the Newton-Raphson method. The results demonstrate that significant weight savings can be realized through the use of variable thickness designs. Author

N74-31359*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ULTRASONIC MEASUREMENT OF STRESS IN RAILROAD WHEELS AND IN LONG LENGTHS OF WELDED RAIL
W. N. Clotfelter and E. R. Risch Jul. 1974 36 p refs
(NASA-TM-X-64863) Avail: NTIS HC $5.00 CSCL 20K

The failure of high speed emergency braking is discussed for railroad wheels and track. It is shown that high compressive residual stresses exist in the rims of new wheels which generate excessive heat, reducing the stress levels. Thermal stresses that build up in continuous lengths of welded track are reported and nondestructive methods of measuring stresses in thick steel are presented for identification, replacement, or adjustment before hazardous failures occur. M.C.F.

N74-31360*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
EVALUATION OF A METAL SHEAR WEB SELECTIVELY REINFORCED WITH FILAMENTARY COMPOSITES FOR SPACE SHUTTLE APPLICATION Final Report
J. H. Laakso and J. W. Straayer Washington NASA Aug. 1974 78 p refs
(Contract NAS1-10860)
(NASA-CR-2409; D180-17969-1) Avail: NTIS HC $4.00 CSCL 20K

A final program summary is reported for test and evaluation activities that were conducted for space shuttle web selection. Large scale advanced composite shear web components were tested and analyzed to evaluate application of advanced composite shear web construction to a space shuttle orbiter thrust structure. The shear web design concept consisted of a titanium-clad + or - 45 deg boron/epoxy web laminate stiffened with vertical boron-epoxy reinforced aluminum stiffeners and logitudinal aluminum stiffening. The design concept was evaluated to be efficient and practical for the application that was studied. Because of the effects of buckling deflections, a requirement is identified for shear buckling resistant design to maximize the efficiency of highly-loaded advanced composite shear webs.
Author

N74-31361# Oak Ridge National Lab., Tenn.
HEAVY-SECTION STEEL TECHNOLOGY PROGRAM Semiannual Progress Report, period ending 28 Feb. 1973
Feb. 1974 106 p refs
(Contract W-7405-eng-26)
(ORNL-4918) Avail: NTIS HC #5.45

The materials investigations under the HSST program are divided into studies of unirradiated materials and studies of irradiation effects. The studies of unirradiated materials, which include inspection, characterization, metallurgy, variability determinations, transition temperature investigations, fracture mechanics studies, and fatigue-crack propagation tests, are discussed. The investigations of irradiated materials include studies of radiation effects on A-533-B steel. Results of studies on thick pressure vessels and pipes of ASTM A508 steel are also reported along with results of studies on Mode 111 crack extension in reactor piping. Author (NSA)

N74-31362# Brown Univ., Providence, R.I. Div. of Engineering.
ELASTIC-PLASTIC BEHAVIOR OF A LONGITUDINAL SEMI-ELLIPTIC CRACK IN A THICK PRESSURE VESSEL
P. V. Marcal, P. M. Stuart, and R. S. Bettes Jun. 1973 38 p refs Prepared for ORNL Sponsored by AEC
(Contract ORNL-3153)
(HSSTP-TR-28) Avail: NTIS HC $4.00

A review of previous work on finite element analysis of three-dimensional flawed structures is presented. New work on a special crack tip element is reported. The crack tip element was formed from an eight node isoparametric element by coalescing pairs of nodes around the crack boundary. Meshes generated in this way gave good results for stress intensity factors even for coarse meshes. Result were obtained for a semi-elliptical crack in a tensile specimen and a thick-walled cylinder. An elastic-plastic analysis of the flawed thick-walled cylinder was performed. Author (NSA)

N74-31363# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DYNAMIC BEHAVIOR OF A HOLLOW ELASTIC CYLINDER COVERED WITH A SHELL
B. V. Gulin 8 Apr. 1974 27 p refs Transl. into ENGLISH from Issled. po Teorii Plastin in Obolochek (USSR), no. 8, 1972 p 329-346
(AD-779176; FTD-HT-23-0363-74) Avail: NTIS CSCL 20/11

A numerical analysis is developed of the dynamic behavior of a structure consisting of a hollow elastic cylinder covered with thin elastic shell under the effect of internal pressure which is variable along the cylinder axis and with time. The solution is accomplished using the method of grids. Problems of stability and economy of the various difference systems are discussed. Based on numerical results presented for constructing infinite length, a conclusion is made that the shell can be considered as inertialess. The supposition concerning its absolute rigidity leads to large errors when determining displacements. Author

N74-31364# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
FINITE-DEFORMATION ANALYSIS OF THE ELASTOSTATIC FIELD NEAR THE TIP OF A CRACK: RECONSIDERATION AND HIGHER-ORDER RESULTS
James K. Knowles and Eli Sternberg Mar. 1974 66 p refs
(Contract N00014-67-A-0094-0020)
(AD-779072-TR-29) Avail: NTIS CSCL 20/11

The authors return to the asymptotic analysis, within the nonlinear equilibrium theory of compressible elastic solids, of the deformations and stresses near the tip of a traction-free crack in a slab of all-around infinite extent under conditions of plane strain. As before, the loading at infinity is taken to be one of uniform uni-axial tension at right angles to the faces of the crack. It is shown that once a restrictive assumption introduced at the start of our earlier asymptotic treatment of the problem is relinquished, certain perplexing anomalies encountered in the previous analysis no longer arise. The present reconsideration of the problem leads to modifications in the dominant-order results for the secondary deformations and stresses, while those pertaining to the physical quantities of primary interest remain unaffected. Furthermore, this investigation encompasses some high-order considerations, which supply an essential clarification and improvement of the lowest-order asymptotic solution.
Author (GRA)

N74-31365# Transportation Systems Center, Cambridge, Mass.
ANALYTICAL FINITE ELEMENT SIMULATION MODEL FOR STRUCTURAL CRASHWORTHINESS PREDICTION Interim Report, Apr. - Sep. 1973
S. Pasternack Oct. 1973 65 p refs
(PB-228136/8; DOT-TSC-NHTSA-73-12; DOT-HS-801-018)
Avail: NTIS HC $3.75 CSCL 13F

Incremental equations governing the nonlinear elasto-plastic dynamic response of three-dimensional frame structures are derived, where the associated stiffness and compatibility matrices also incorporate large geometry changes. A discussion of yield criteria is given, together with bound type estimates for thin walled cross section beams. The Newmark beta method is then used to solve the equations of motion, and is oriented toward the particular incremental equations typical of the present application. Author (GRA)

N74-31366# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
TRANSIENT ANALYSIS OF FATIGUE CRACK PROPAGATION UNDER A STEP INCREASE IN LOADING
Saurindranath Majumdar May 1974 25 p refs
(Contract DAHC15-73-G-7; DAHC15-72-G-10)
(AD-780188; T/AM-388; UILU-ENG-74-6010) Avail: NTIS CSCL 11/6

In a previous report, steady state crack propagation at a constant stress intensity factor range was analyzed on the basis of a cumulative fatigue damage model. In this model, the points ahead of a crack tip were assumed to constitute a series of uniaxial fatigue specimen and fatigue crack propagation was viewed as the successive fatigue failure of these specimens. In this report an extension of the previous analysis to a situation involving an increase in the stress intensity factor range from a lower level to a higher level is carried out. The analysis indicates that there is a transient zone through which the crack has to grow before attaining the full steady state crack propagation rate corresponding to the higher load level. Numerical results have been computed for three steels of comparable ductility but widely varying yield strength. The results show that both the crack length increment and the number of cycles involved in the transient period decrease with increasing yield strength. Also, for any given steel, the crack length increment during the transient increases with the load ratio but the number of cycles, is independent of the load ratio. Author (GRA)

N74-31367# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AEROHYDROELASTICITY THEORY (CHAPTER 9)
V. V. Bolotin and Yu. N. Novichkov 23 Apr. 1974 76 p refs Transl. into ENGLISH from Prochnost i Ustoichivost-Kolebaniya (USSR), v. 3, 1968 p 478-512
(AD-780364; FTD-HC-23-1003-74) Avail: NTIS CSCL 20/4

Aerohydroelasticity theory is discussed as a complex area of mechanics which includes methods of elasticity theory and structural mechanics. A static aerohydroelasticity problem is presented along with characteristics of hydroelasticity and its dynamic problems. M.C.F.

N74-31368# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF FAILURE PROCESS IN REINFORCED PLATES
V. V. Bolotin 30 Apr. 1974 13 p refs Transl. into ENGLISH from Tr. Mosk. Energ. Inst. (Moscow), no. 74, 1970 p 115-124
(AD-780333; FTD-HT-23-778-74) Avail: NTIS CSCL 11/4

The failure process of reinforced plates is studied under a constant rate of strain and maintained under constant strain conditions. The results of the statistical processing are compared with theoretical results obtained from a stochastic model. Mechanisms which might control the propagation of a main crack are discussed. GRA

N74-31369# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ESTIMATIONS OF THE EFFECT OF DESIGN CHANGES ON THE MODES AND FREQUENCIES OF VIBRATING STRUCTURAL ELEMENTS M.S. Thesis
Edward G. Taylor Mar. 1974 82 p refs
(AD-780499; GAW/MC/74-17) Avail: NTIS CSCL 20/11

As the state description of a structural system changes, the eigenvalues and eigenfunctions may also change. The paper derives expressions for the rates of change of these characteristic quantities for continuous systems. These derivatives can be used in a Taylor series to predict values for perturbed designs. Normally a series of approximation is valid within some narrow neighborhood of the initial or known state. An iterative technique is developed which reduces this restriction. The field of structural optimization has achieved greater importance as more is demanded of designs. Least mass solutions are obtained for the sandwich and solid rectangular beams. The problem of optimizing an Euler column is also examined. (Modified author abstract) GRA

N74-31370# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
GALERKIN'S APPROXIMATION TO MINIMUM WEIGHT STRUCTURES WITH DYNAMIC CONSTRAINTS M.S. Thesis
Gerald M. VanKeuren, Jr. Mar. 1974 71 p refs
(AD-780498; GAW/MC/74-18) Avail: NTIS CSCL 20/11

Galerkin's method is applied to the design of minimum weight structures with dynamic constraints. The problems considered include the weight optimization of a simply supported beam and a panel, with the condition that their fundamental frequencies be the same as those of corresponding uniform thickness structures. Galerkin's method is also used for the weight optimization of a semi-infinite panel and of a finite square panel, both of which have flutter speed constraints. In addition, the assumption of a symmetric thickness distribution in the flutter problems is investigated. (Modified author abstract) GRA

N74-31371# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE REACTION OF A FIBERGLASS CYLINDRICAL SHELL TO THE ACTION OF A BLAST LOAD
A. A. Naida and V. K. Ovchinnikov 19 Apr. 1974 14 p refs Transl. into ENGLISH from Prikl. Mekh. (USSR), v. 8, no. 9, 1972 p 20-25
(AD-780360; FTD-HT-23-1488-74) Avail: NTIS CSCL 19/4

The dynamic behavior of cylindrical shells under blast loads was tested. Tests were made of longitudinal and circumferential elasticity, fiber glas elastic disturbances, and shell deformation. It was found that blast loads caused the shells to unwind, and have significant deflections without causing failure.
Author (GRA)

N74-31372# California Univ., Berkeley. Structural Engineering Lab.
EXTENSION OF THREE DIMENSIONAL ANALYSIS TO SHELL STRUCTURES USING THE FINITE ELEMENT IDEALIZATION Ph.D. Thesis
Henry H. Dovey Feb. 1974 186 p refs
(PB-230353/5; UCSESM-74-2) Avail: NTIS HC $12.50 CSCL 20K

A three dimensional finite element which is appropriate for use in general shell applications is presented. It is shown that a simple recasting of the element formulation which introduces relative displacements eliminates problems of numerical sensitivity which arise when using standard three dimensional elements in thin shell applications. A technique of incorporating geometric constraints on the permissible displacements of individual nodes is demonstrated. (Modified author abstract) GRA

N74-31373# California Univ., Berkeley. Structural Engineering Lab.
NONSAP: A STRUCTURAL ANALYSIS PROGRAM FOR STATIC AND DYNAMIC RESPONSE OF NONLINEAR SYSTEMS
Klaus-Jurgen Bathe, Edward L. Wilson, and Robert H. Iding Feb. 1974 172 p refs
(PB-231112/4; UCSESM-74-3) Avail: NTIS HC $5.00 CSCL 20K

The current version of the computer program NONSAP for linear and nonlinear, static and dynamic finite element analysis is described. The solution capabilities, the numerical techniques used, the finite element library, the logical construction of the program and storage allocations are discussed. The user's manual of the program is given. Some sample solutions are included, which are standard data cases available with the program. Author (GRA)

N74-31374# Naval Ordnance Lab., White Oak, Md.
DESIGN GUIDE FOR RADIOISOTOPE POWER GENERATOR PRESSURE VESSELS Final Report, Dec. 1972 - Jan. 1974
Bernard M. Finn 6 Feb. 1974 90 p refs
(AD-780215; NOLTR-74-33) Avail: NTIS CSCL 18/14

The guide is the end product of an engineering investigation to establish criteria and inspection procedures to assure long term structural and watertight integrity for radioisotope power generator (RPG) pressure vessels. The suggested construction of the RPG consists of a cylindrical pressure housing with either two formed torospherical end closures circumferentially edge welded to the housing or a flanged housing to which a formed

end closure is bolted. The materials of construction are comprised of alloys of nickel, copper and titanium with the Hastelloy alloy C-276 being the preferred choice. The design of the electrical penetrator follows that suggested in the Handbook of Vehicle Penetrators, Connectors and Harnesses for Deep Ocean Applications. The testing requirements consist of design verification tests for the electrical penetrators and sequential hydrostatic and leak testing of the RPG pressure vessel. The hydrostatic tests should be performed at 1.5 times design operating pressure.
Author (GRA)

N74-31375# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STATISTICAL PROBLEMS OF VIBRATION AND BUCKLING STRENGTH IN ELASTIC SYSTEMS, CHAPTER 10
V. V. Bolotin and M. F. Dimentberg 3 May 1974 47 p refs Transl. into ENGLISH from Prochnost i Ustoichivost-Kolebaniya (USSR), v. 3, 1968 p 513-546
(AD-779831; FTD-HC-23-1004-74) Avail: NTIS CSCL 20/11
Statistical dynamics in mechanical systems are discussed including the concepts, structural reliability, and the random factors in the analysis of structural results. Quasi-static correlation, and kinematic methods are applied to the problems. F.O.S.

N74-30934* Boeing Co., Seattle, Wash.
RESIDUAL THERMAL STRESS CONTROL IN COMPOSITE REINFORCED METAL STRUCTURES
J. B. Kelly and R. R. June *In* NASA. Langley Res. Center Proc. of the Symp. on Welding, Bonding, and Fastening Dec. 1972 26 p refs (For availability see N74-30922 20-15)
(Contract NAS1-8858)
CSCL 20K

N74-31060 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF FUNCTIONS OF THE SPATIAL CORRELATION OF A FIELD IN THE SPACE BETWEEN AN ELASTIC PLATE AND A RIGID SCREEN IN TERMS OF A KNOWN (MEASURED) FUNCTION OF SPATIAL CORRELATION IN ONE CROSS-SECTION OF THIS SPACE
V. I. Klyachkin and R. A. Sokolova *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 100-103 Transl. into ENGLISH from "Pervyy Vsesoyvznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 104-107 (For availability see N74-31043 20-19)

N74-31062 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE RADIATION FIELD OF A CYLINDRICAL SHELL EXCITED BY RANDOM FORCES
G. I. Usoskin *In its* First All-Union Symp. (JPRS-62432) 10 Jul. 1974 p 107-110 refs Transl. into ENGLISH from "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparaturnyy Analiz Sluchaynykh Protsessov i Poley" Novosibirsk, 1968 p 111-114 (For availability see N74-31043 20-19)

N74-31306* Auburn Univ., Ala.
STRESSES IN DOME-SHAPED SHELLS OF REVOLUTION WITH DISCONTINUITIES AT THE APEX
C. H. Chen, J. C. M. Yu, and W. A. Shaw *In its* Multivariant Function Model Generation Jan. 1974 118 p refs (For availability see N74-31299 20-30)
CSCL 20K

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-31376 British Library Lending Div., Boston Spa (England).
THE EQUATION OF STATE FOR PURE FLUID MATERIALS
Werner Alexander Stein 28 Dec. 1973 25 p refs Transl. into ENGLISH from Chem. Eng. Sci. (London), v. 27 1972 p 1371-1382
(BLL-NEL-TT-2520-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons
An equation of state is presented, which satisfies the conditions of triple contact and the first and second limit conditions at the critical point. In addition are used: the extended correspondence law for the second virial coefficient, the specific isochoric residual heat capacity and some derivatives of the equation of state at the critical point, which must be considered for the third limit condition at the critical point. Author

N74-31377 British Library Lending Div., Boston Spa (England).
HEATING WITH MINIMUM OXIDATION WITH FINITE HEAT EXCHANGE PARAMETERS
V. M. Ryabkov [1974] 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 8, 1973 p 142-144
(BLL-M-21835-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon
The results of the solution of the problem of optimum control in heating massive bodies with minimum oxidation are discussed. An attempt is made to replace partial solutions of the problem by a general solution. An endless plate of specified thickness was used as the body to be heated. The results obtained from the study are extended to three dimensional bodies and the method of solution can also be used in the case of complex boundary conditions. Author

N74-31378 British Library Lending Div., Boston Spa (England).
EXPERIMENT PLANNING USED FOR INVESTIGATING HEAT TRANSFER BY CONVECTION, REPORT 1
V. V. Sterligov and V. F. Evtushenko [1974] 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern Met. (USSR), v. 8, 1973 p 162-165
(BLL-M-21830-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon CSCL 20M
The special features of using experiment planning for problems connected with heat transfer by convection are analysed theoretically. The conditions for selecting the independent and input factors, and for selecting the variation range taking into account the auto-modelling region, are formulated; a method is proposed for generalizing the results for a number of similar phenomena by transfering from regression equations for heat transfer to oriterial similarity equations. Author

N74-31379# National Bureau of Standards, Boulder, Colo.
THE SPECIFIC HEATS, C SUB SIGMA AND C SUB V, OF COMPRESSED AND LIQUEFIED METHANE
B. A. Younglove [1974] 24 p refs Submitted for publication Sponsored by American Gas Association
(Paper-K1) Avail: NTIS HC $4.25
The specific heats of saturated liquid methane have been measured at 66 temperatures in the temperature range 95-187 K. The specific heats at constant volume, have been measured at 20 densities ranging from 0.8 to 2.8 times the critical density at temperatures between 91 and 300 K, and at pressures to 330 bar (at 280 PVT states in all). The uncertainty of most of the measurements is estimated to be less than 0.5%, except near the critical point. These measurements were performed primarily to provide input data for accurate thermodynamic properties data calculations for liquid methane. They are believed to be the most comprehensive specific heat measurements available for pure compressed gaseous and liquid methane.
Author

N74-31380# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
HEAT TRANSFER TO SLUSH HYDROGEN
C. Sindt 10 Aug. 1973 20 p refs Presented at the Cryogenic Eng. Conf., Atlanta, 8-10 Aug. 1973
(Paper-D2) Avail: NTIS HC $4.00
The use of slush hydrogen as a rocket propellant was investigated in a series of heat transfer experiments in a small laboratory apparatus. A 2.54 cm diameter cylindrical block of electrolytic tough pitch copper was selected as the specimen, and six carbon resistors embedded in a high thermal conductivity epoxy served as the heat source. The following four types of tests were conducted: (1) heat transfer at one atmosphere pressure

in liquid at normal boiling point temperature; (2) heat transfer at triple-point pressure in liquid hydrogen; (3) heat transfer at triple-point pressure in settled slush hydrogen; and (4) heat transfer in settled slush hydrogen at one atmosphere pressure using helium as the pressurizing gas. Graphical data are provided which represent the results, and a concluding discussion is presented which reflects the accuracy and applicability of the data obtained. A.A.D.

N74-31381*# Rocketdyne, Canoga Park, Calif.
ANALYSIS OF COMBUSTION INSTABILITY IN LIQUID PROPELLANT ENGINES WITH OR WITHOUT ACOUSTIC CAVITIES Final Report
C. L. Oberg, R. C. Kesselring, C. Warner, III, and M. D. Schuman Jun. 1974 114 p refs
(Contract NAS9-12077)
(NASA-CR-134387; R-9353) Avail: NTIS HC $8.75 CSCL 21B

Analytical studies have been made of the relative combustion stability of various propellant combinations when used with hardware configurations representative of current design practices and with or without acoustic cavities. Two combustion instability models, a Priem-type model and a modification of the Northern Research and Engineering (NREC) instability model, were used to predict the variation in engine stability with changes in operating conditions, hardware characteristics or propellant combination, exclusive of acoustic cavity effects. The NREC model was developed for turbojet engines but is applicable to liquid propellant engines. A steady-state combustion model was used to predict the needed input for the instability models. In addition, preliminary development was completed on a new model to predict the influence of an acoustic cavity with specific allowance for the effects the nozzle, steady flow and combustion. Author

N74-31382*# Maryland Univ., College Park.
VISCOSITY AND THERMAL CONDUCTIVITY COEFFICIENTS OF GASEOUS AND LIQUID OXYGEN Final Report
H. J. M. Hanley (NBS, Boulder, Colo.), R. D. McCarty (NBS, Boulder, Colo.), and J. V. Sengers Washington NASA Aug. 1974 77 p refs
(Grant NGL-21-002-344)
(NASA-CR-2440) Avail: NTIS HC $4.00 CSCL 20M

Equations and tables are presented for the viscosity and thermal conductivity coefficients of gaseous and liquid oxygen at temperatures between 80 K and 400 K for pressures up to 200 atm. and at temperatures between 80 K and 2000 K for the dilute gas. A description of the anomalous behavior of the thermal conductivity in the critical region is included. The tabulated coefficients are reliable to within about 15% except for a region in the immediate vicinity of the critical point. Some possibilities for future improvements of this reliability are discussed. Author

N74-31383# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RATE OF COMBUSTION OF THREE-COMPONENT MIXTURE SYSTEMS
V. S. Nikiforov, N. N. Bakhman, T. N. Kruk, and F. P. Madyakin 19 Apr. 1974 11 p refs Transl. into ENGLISH from Fiz. Goreniya Vzryva (Novosibirsk), v. 7, no. 4, Dec. 1971
(AD-779206; FTD-HT-23-1220-74) Avail: NTIS CSCL 21/2

Using model mixtures of ammonium perchlorate (APC) - polystyrene (PS) and potassium perchlorate (PPC) - PS, the effect of percentage of the addition of finely-dispersed and relatively coarsely-dispersed aluminum is studied in detail. Also studied is the effect of the relationship between the oxidizer and PS on the effectiveness of action of the aluminum addition. GRA

N74-31384# Iowa State Univ. of Science and Technology, Ames. Heat Transfer Lab.
COMBINED FORCED AND FREE LAMINAR CONVECTION IN HORIZONTAL TUBES
S. M. Morcos and A. E. Bergles Jan. 1974 168 p refs
(Grant NSF GK-36851)
(PB-231643/8; ISU-ERI-AMES-74008; HTL-1) Avail: NTIS HC $11.50 CSCL 20M

The report describes an experimental study of the effects of property variations, particularly density and viscosity, on fully-developed laminar flow heat transfer and pressure drop in horizontal tubes. Electrically heated glass and stainless-steel tubes were used with water and ethylene glycol. The heat transfer data were correlated by expressing the Nusselt number as a function of Grashof number, Prandtl number, and a dimensionless parameter representing the conductance of the tube wall. The correlation agrees well with data of previous investigations. A correlation is also provided for the friction factor as a function of Reynolds number and Grashof number. GRA

N74-31385# Rome Air Development Center, Griffiss AFB, N.Y.
THEROS: A COMPUTER PROGRAM FOR HEAT FLOW ANALYSIS Final Report, Jan. 1973 - Feb. 1974
Thomas J. Rossiter Apr. 1974 52 p
(AD-780514; RADC-TR-74-113) Avail: NTIS CSCL 20/13

The report describes the use of a computer program called THEROS which is capable of performing a time dependent thermal analysis of relatively complex geometrical structures. The program is written in FORTRAN 5 and is available to all users of the RADC computer system. It is designed with the user in mind, requiring only a few, very simple instruction statements. Theros has fast computation time and can analyze two dimensional, multi-material structures having temperature dependent thermal conductivities. Author (GRA)

N74-31386# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE POSSIBILITY OF VERY LOW FREQUENCY OSCILLATIONS IN A SEMICLOSED SPACE
J. K. Gusachenko 12 Nov. 1973 12 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" USSR, 1972 p 100-103
(AD-770943/9; FTD-HT-23-635-74) Avail: NTIS CSCL 07/4

Systems are shown in which the regulation of the arrival of gas from solid fuel is achieved by a change in the combustion surface. The stability of burning initiated by a quick-burning thin rod in a chamber, relative to the vibrations of the form of its surface, is studied. GRA

N74-31387# Battelle Memorial Inst., Columbus, Ohio.
THERMAL RADIATION MODELING FOR POLLUTION PREDICTIONS Final Report
G. R. Whitacre, R. A. McCann, and A. A. Putman Feb. 1974 65 p refs
(Grant EPA-R800842)
(PB-229666/3; EPA-650/2-74-011) Avail: NTIS HC $6.25 CSCL 20M

The report gives results of a study of the mathematical modeling of the combustion process. It indicates that adequate treatment of thermal radiation is essential and that accurate temperatures are especially important for pollutant predictions since the chemical kinetics are extremely temperature dependent. It describes test cases that were run which combined the Hottel Zone Method with a completely analytical flow and mixing solution: the complexities that arise when this approach is extended to real systems seem to eliminate it as a working tool. The results were used to check the accuracy or several four-flux radiation approximations which are simpler than the Zone Method: although temperature predictions were reasonable, the four-flux approximation failed in predicting the wall radiation fluxes at many locations. (Modified author abstract) GRA

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-31388*+ National Aeronautics and Space Administration, Washington, D.C.
MANAGEMENT: A CONTINUING LITERATURE SURVEY WITH INDEXES, MARCH 1974
Mar. 1974 157 p refs

(NASA-SP-7500(08)) Avail: NTIS HC $5.50 CSCL 05A

This special bibliography lists 597 reports, articles, and other documents introduced into the NASA scientific and technical information system in 1973. Author

N74-31389 British Library Lending Div., Boston Spa (England).
THE ENERGY POLICY OF THE GERMAN FEDERAL GOVERNMENT
10 Dec. 1973 49 p Transl. into ENGLISH from the report of the Office of the Federal Min. for Trade and Ind. of the FRG, Bonn, 26 Sep. 1973
(BLL-OA-Trans-886-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

The energy supply and demand for Germany are discussed for the present and the future. The changes from a buyers' market with the production surpluses in the sixties to a sellers' market is described, and results show an upward trend in prices. Policies in the various fields of energy supply require intensified international cooperation for the security of long term supply. Energy research of natural gas, brown and hard coal is also discussed. M.C.F.

N74-31390 British Library Lending Div., Boston Spa (England).
THE PROBLEMS OF EFFICIENT UTILIZATION OF NATURAL RESOURCES
V. Prokudin [1974] 5 p refs Transl. into ENGLISH from Econ. Gazeta (USSR), no. 44, 1973
(BLL-M-23272-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Problems of environmental protection are briefly discussed. An integrated program is presented for the development of a general and comprehensive program of cooperation in the field of environment protection and the efficient utilization of natural resources. M.C.F.

N74-31391*# Southeastern State Coll., Durant, Okla. Technology Use Studies Center.
TECHNOLOGY UTILIZATION IN A NON-URBAN REGION: FURTHER IMPACT AND TECHNIQUE OF THE TECHNOLOGY USE STUDIES CENTER Final Report
C. Henry Gold, A. M. Moore, Bill Dodd, and Velma Dittmar Jun. 1974 82 p
(Contract NASw-2512)
(NASA-CR-139565) Avail: NTIS HC $7.25 CSCL 05A

Updated information pertaining to clients who receive and use information disseminated by the Technology Use Studies Center (TUSC) is reported. Charts are provided which indicate TUSC's performance in information dissemination and technical assistance in terms of quantities of searches accomplished during several contract years. The faculty information service is described, along with details of cooperation with other agencies. Specific searches are listed according to subject, client, and client location, and a measure of client response to services provided is indicated by the included selection of transfer and impact reports. The impetus behind the formation of the general aviation news letter is also described. A.A.D.

N74-31392*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NONLINEAR MODELS FOR ESTIMATING GSFC TRAVEL REQUIREMENTS
Charles Buffalano and Francis J. Hagan Washington Aug. 1974 12 p
(NASA-TN-D-7642; G-7415; D-7642) Avail: NTIS HC $3.00 CSCL 05C

A methodology is presented for estimating travel requirements for a particular period of time. Travel models were generated using nonlinear regression analysis techniques on a data base of FY-72 and FY-73 information from 79 GSFC projects. Although the subject matter relates to GSFX activities, the type of analysis used and the manner of selecting the relevant variables would be of interest to other NASA centers, government agencies, private corporations and, in general, any organization with a significant travel budget. Models were developed for each of six types of activity: flight projects (in-house and out-of-house), experiments on non-GSFC projects, international projects, ART/SRT, data analysis, advanced studies, tracking and data, and indirects. Author

N74-31393# Environmental Protection Agency, Washington, D.C.
A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMMENDMENTS AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT Water Quality Strategy Paper
15 Mar. 1974 90 p
Avail: NTIS HC $7.50

Near and long range views are presented for water pollution control. Goals are projected for FY-75 along with a broader perspective for 1983. Water quality standards and toxic effluent standards are described with program and management planning for water pollution control. M.C.F.

N74-31394# Committee on Appropriations (U. S. House).
SPECIAL ENERGY RESEARCH AND DEVELOPMENT APPROPRIATIONS BILL FOR 1975. PART 1: DEPARTMENT OF THE INTERIOR
Washington GPO 1974 977 p refs Hearings before Subcomm. of the Comm. on Appropriations, 93d Congr., 2d Sess., 11 Feb. 1974, 4 Mar. 1974, 5 Mar. 1974
(GPO-29-514) Avail: Subcomm. on the Dept. of the Interior and related agencies

An overview of energy programs within the Department of Interior was presented in a Congressional hearing called to hear testimony on the Trans-Alaska Pipeline, development of the Outer Continental Shelf, remote sensing of mineral resources, and research in the efficient extraction, conversion, and use of geothermal energy, oil shale, coal, and natural gas. Short term considerations, intermediate tasks, and long term strategy are discussed for the Federal Energy Office, Geological Survey, Office of Coal Research, and the Bureau of Mines. Budget figures, specific programs, management structure, and contracts are described for each organization, and rationales are given for each of their various contributions towards a unified national program in energy research and development. Fuel allocation, foreign trade, market considerations, oil and gas programs, and energy conservation and analysis are discussed in light of current and expected per capita energy demand in the U.S. strip mining, mine health and safety, and mine waste management are also considered along with debate concerning possible adjustment of the Federal Energy Budget. A.A.D.

N74-31395# Rockwell International Corp., Canoga Park, Calif.
FOREIGN TRADE IMPACT OF THE NATIONAL SPACE PROGRAM
[1973] 13 p
Avail: NTIS HC $4.00

The position of the United States in the world trade is reported showing technology as a major factor in producing trade. The research and development of space technology is considered as another element in the production of trade. Tables show the growth rate of the U.S. and other countries. M.C.F.

N74-31396# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT; SPACE, SCIENCE, VETERANS, AND CERTAIN OTHER INDEPENDENT AGENCIES APPROPRIATIONS BILL, 1975
William Proxmire Washington GPO 15 Aug. 1974 55 p Rept. to accompany H. R. 15572 presented by the Comm. on Appropriations at the 93d Congr., 2d Sess., 15 Aug. 1974
(S-Rept-93-1091; GPO-38-010) Avail: US Capitol, Senate Document Room

A report is presented from the Committee recommending a budget for the Department of Housing and Urban Development, the National Aeronautical and Space Adminstration, the National Science Foundation, the Veterans Administration and eight other independent agencies. M.C.F.

N74-31397# Committee on Aeronautical and Space Sciences (U. S. Senate).
TECHNOLOGY RESOURCES SURVEY AND APPLICATIONS ACT
Washington GPO 1974 159 p Hearings on S. 2495 before Comm. on Aeronaut. and Space Sci. and the Comm. on Commerce, 93d Congr., 2d Sess., 11 Mar., 21 Mar. 1974 Prepared in cooperation with Comm. on Commerce (U. S. Senate)

(GPO-32-205) Avail: SOD HC $1.40

A Congressional hearing was conducted concerning legislation to provide for more effective utilization of the scientific and technological resources of the United States in the solution of critical domestic problems. The organization and functions of a Federal Council for Science and Technology are discussed. The establishment of an Office of Technology Application within the National Aeronautics and Space Administration is recommended. The organization, functions, and funding of the Office of Technology Application are reported. Author

N74-31398# Rockwell International Corp., Canoga Park, Calif. Space Div.

THE LONG-TERM ECONOMIC IMPACT OF SPACE RESEARCH AND DEVELOPMENT TECHNOLOGY

Sep. 1973 16 p refs

Avail: NTIS HC $4.00

The role the space program plays in influencing the course of the economy is described applying the fact that research and development activity is the most important source of technology advancement. This study augments the earlier studies by adding a long term dimension to the economic effects of the space program. M.C.F.

N74-31399# Rockwell International Corp., Canoga Park, Calif. Space Div.

BENEFITS OF HIGH-TECHNOLOGY PROGRAMS IN A TIGHT FEDERAL BUDGET ENVIRONMENT

[1974] 8 p ref

Avail: NTIS HC $4.00

Federal budgets are described using technology as a means to reduce the deficit with a minimum cost to employment and output. Alternatives, are explained maintaining that the space program is significant in the advancement of technology and keeping federal expenditures in check. M.C.F.

N74-31400# Rockwell International Corp., Canoga Park, Calif. Space Div.

IMPACT OF SPACE RESEARCH AND DEVELOPMENT ON ECONOMIC GROWTH AND PRODUCTIVITY

[1974] 14 p refs

Avail: NTIS HC $4.00

Productivity increase and economic growth are reported as vital in meeting the future socio-economic needs of the nation. It is stated that the most important key to achieving this growth is technological change. A study of the effects of space research and development concludes that the demands of the space program produce greater than average economic benefits. M.C.F.

N74-31401# Atomic Energy of Canada Ltd., Chalk River (Ontario). Chemistry and Materials Div.

[RESEARCH ON ION PENETRATION, ELECTRON MICROSCOPY, RADIATION DAMAGE, AND NUCLEAR PHYSICS AND CHEMISTRY] Progress Report, 1 Apr. - 30 Jun. 1973

Aug. 1973 107 p

(AECL-4597; PR-CMa-25) Avail: AEC Depository Libraries HC $7.50; Atomic Energy of Can. Ltd., Chalk River $2.00

Progress is reported in the following fields: solid-state science (ion penetration, electron microscopy, radiation damage, nuclear methods of analysis, nuclear chemistry), general chemistry (analytical chemistry, radioactivity, measurements, electrochemistry, mass spectrometry, fuel analysis), physical chemistry (radiation chemistry, H-H2O exchange, isotope chemistry), materials science (surface chemistry, ceramics, metal physics), and H/D separation. NSA

N74-31402# Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.

[RADIATION EFFECTS ON THE ENVIRONMENT. PART 1: RESEARCH AND DEVELOPMENT] Annual Report, period ending 31 Dec. 1972

1973 247 p refs

(BARC-706-Pt-1) Avail: AEC Depository Libraries HC $14.50

Research and development are summarized in the following areas: radiation physics, radiation dosimetry, internal dose calculations, instrumentation, assessment of airborne radioactive pollutants, aerosols and atmospheric pollution, micrometeorology, nuclear safety, marine radioactivity and oceanography, radioactive fallout, environmental natural radioactivity, radioecology, environmental pollution, air cleaning, internal radioactive contamination and industrial toxicology, clinical applications of wholebody radioactivity counting, and industrial hygiene and safety. NSA

N74-31403# Army War Coll., Carlisle Barracks, Pa.

THE ENERGY CRISIS ISSUES AND ALTERNATIVES Student Essay

George C. Kuekes 20 Oct. 1973 22 p refs

(AD-779366) Avail: NTIS CSCL 05/3

The status of domestic reserves has been reviewed and the adequacy of these reserves and future energy requirements noted. Other energy sources as supplements to the five primary energy sources have been indicated. Alternatives for a solution to the energy crisis have been indicated with the recommended alternative providing for the establishment of a single Federal agency to coordinate the total energy program. Typical policies that should be developed, are indicated and include conservation and research and development. (Modified author abstract) GRA

N74-31404# Office of Naval Research, London (England).

EUROPEAN SCIENTIFIC NOTES, VOLUME 28, NUMBER 3

Bruce J. McDonald, and Victoria S. Hewitson 29 Mar. 1974 48 p

(AD-779271; ESN-28-3) Avail: NTIS CSCL 05/2

The monthly publication presents brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. (Modified author abstract) GRA

N74-31405# Naval Postgraduate School, Monterey, Calif.

VELOCITY, KINETIC ENERGY, AND PRESSURE DEVIATIONS RESULTING FROM THE ADAPTATION OF A SECONDARY PROPELLANT CHAMBER ON A 30-06 RIFLE BARREL M.S. Thesis

Charles Carmen Failla Dec. 1973 73 p refs

(AD-775020/1) Avail: NTIS HC $6.75 CSCL 19/6

A secondary chamber was adapted to a 30-06 pressure barrel as a means for increasing muzzle velocity without exceeding the barrel pressure rating. Ignition of the secondary charge was accomplished by the high pressure gases behind the bullet. Resulting muzzle velocities were determined for various amounts of three granular and one liquid propellant. Pressure-time curves were obtained for one of the faster burning powders. Adiabatic bomb calorimeter testing and published data were used to determine the heats of combustion. The data suggested that the rate of energy release, and not the heat of combustion, was the dominant factor . The results also indicated that a more optimum location of the secondary charge was possible. (Modified author abstract) GRA

N74-31406# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

SOFTWARE ARCHITECTURE FOR THE TRAFFIC ANALYSIS AND DISPLAY SYSTEM OF THE SAN FRANCISCO VESSEL TRAFFIC SYSTEM

R. G. King and F. S. Gregorski Dec. 1973 40 p refs Sponsored by DOT

(AD-779614; APL-MSC-73-353; USCG-D-83-74) Avail: NTIS CSCL 13/10

The Traffic Analysis and Display (TAD) system for the San Francisco experimental Vessel Traffic System (VTS) was designed to enable operators to obtain position, speed, and identification information on vessels of interest more accurately and quickly than was previously possible from manual systems. The basic system is described in other documents. However, a short description of the operator consoles is given here for clarity, followed by a description of the software in terms of present capability and expandability. GRA

N74-31407# Naval Research Lab., Washington, D.C.

REPORT OF NRL PROGRESS

Sep. 1973 94 p refs

(PB-229392/6) Avail: NTIS HC $3.75 CSCL 05B

Activities of the Naval Research Lab are reported for its use as a central information computer facility. Scientific programs include: acoustics, chemistry, communication sciences, ocean technology, and nuclear and atomic physics. M.C.F.

N74-31408# Transportation Systems Center, Cambridge, Mass.
FREIGHT TRANSPORTATION INFORMATION SYSTEMS AND THEIR IMPLICATIONS FOR R AND D POLICY Final Report, Jan. - Oct. 1972
Kenneth F. Troup Mar. 1974 86 p refs
(PB-231049/8; DOT-TSC-OST-73-10) Avail: NTIS HC $4.00 CSCL 13F

The current use of computerized management information and control systems in intercity freight transportation is examined. Each of the four modes (railroad, motor carrier, maritime and air cargo industries) is investigated. In each case, computer information systems can help improve the operational efficiency of the mode and provide management (and regulators) with more accurate data for decision making. The intermodal data standard and exchange problem is also discussed. Appropriate recommendations for DOT research and development policy are made. These include development of a national railroad management system, development of terminal control systems for railroad yards and intermodal terminals, support to development of a maritime industry information system and increased effort in the area of data facilitation. GRA

N74-31409# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 1: INTRODUCTORY AND CONTEXT SESSIONS
Nov. 1972 280 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.
(PB-219953/7; MITRE-72-190-Vol-1) Avail: NTIS HC $6.75; HC also available from NTIS $34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of the first two sessions of the Symposium on Energy, Resources, and the Environment sponsored by the MITRE Corporation, Washington, D.C., the Institute of Energy Economics, Tokyo, Japan, and the Nomura Research Institute of Technology and Economics, Tokyo, Japan on July 9th, 10th, 11th, and 12th, 1972. Topics discussed include: Alternative world futures; Review of MITRE study; Long-range prospects for mankind; International economic implications of the nuclear fuel cycle; Japanese energy perspective; U.S. short and medium term issues; Pacific basin development and future; International context. GRA

N74-31410# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 2: PANEL SESSIONS ON ENERGY AND RESOURCE ISSUES
Nov. 1972 502 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.
(PB-219954/5; MITRE-72-190-Vol-2) Avail: NTIS HC $12.50; HC also available from NTIS $34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of two of the four workshop sessions held on July 11th at the Symposium on Energy, Resources, and the Environment held on July 9th, 10th, 11th, and 12th, 1972. The session on Energy Issues featured presentations on The Development of Fusion in Japan and its Prospects, The Multi-Utilization of Nuclear Energy - A Techno-Economical Evaluation of a Process for Large Steel Making. The Present Status and Future Prospects of Energy Utilization in the Iron Industry, Magneto-Hydrodynamic (MHD) Power Generation Status and Prospects for Electric Utility Application, Large Scale Utilization of Solar Energy, and Geothermal Energy. The session devoted to Resource Issues featured presentations on Resource Development as a Function of Japanese Economic Growth, Australian Energy Resources, Indonesian Energy Resources, U.S. Transportation: Some Energy and Environmental Considerations, Urban Transportation, and Uranium Enrichment With a Sea-Thermal Power Plant. GRA

N74-31411# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 3: PANEL SESSIONS ON ENVIRONMENTAL, ECONOMICAL AND INSTITUTIONAL ISSUES
Nov. 1972 462 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.
(PB-219955/2; MITRE-72-190-Vol-3) Avail: NTIS HC $10.60; HC also available from NTIS $34.00/set of 4 reports as PB-219952-SET, CSCL 13B

The report provides a transcript of the proceedings of two of the four workshop sessions held on July 11th at the Symposium on Energy, Resources, and the Environment held on July 9th, 10th, 11th, and 12th, 1972. The session on Environmental Issues featured presentations on Environmental Action Around the World, Climate Change and the Influence of Man's Activities on the Global Environment, Approaches to Canadian Environmental Problems, Assessment of the Industrial EcoSystem and Industrial Policy in Japan, Some Problems Arising out of the Low Sulfur Fuel Supply System in Japan, Coal: The Black Magic, and Environmentally Acceptable Fuels by Today's Technology (With Emphasis on Gasification). The session on Institutional and Economic Issues included Some Comments on U.S. Energy Institutions, Technology Assessment of Mass Energy Consumption, An Idea and Concept of Japan's Policy on Natural Resources Development, Indonesian Institutional and Economic Issues, and The State of Our Mineral Resources. GRA

N74-31412# Mitre Corp., McLean, Va.
SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 4: RECAPITULATION OF ENERGY, RESOURCE, ENVIRONMENTAL, ECONOMIC AND INSTITUTIONAL ISSUES
Nov. 1972 223 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.
(PB-219956/0; MITRE-72-190-Vol-4) Avail: NTIS HC $6.75; HC also available from NTIS $34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of the fourth day of the Symposium on Energy, Resources, and the Environment sponsored by The MITRE Corporation, Washington, D.C., the Institute of Energy Economics, Tokyo, Japan, and the Nomura Research Institute of Technology and Economics, Tokyo, Japan. The session was devoted to reports by the four Workshop Chairmen summarizing the issues discussed during the Energy Issues, Environmental Issues, Resource Issues, and Institutional and Economic Issues sessions. GRA